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**CP172801 – GENERAL SITE: SCHOOL OF MUSIC EXTEND UTILITIES**

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TECHNICAL SPECIFICATIONS - UNIVERSAL/HAZARDOUS MATERIALS REMOVAL AND DISPOSAL

For

UNIVERSITY OF MISSOURI
PROJECT #CP170621
FINE ARTS ANNEX

Prepared for

UNIVERSITY OF MISSOURI – COLUMBIA
Campus Facilities
Columbia, Missouri 65211

Prepared by
UNIVERSITY OF MISSOURI-COLUMBIA
ENVIRONMENTAL HEALTH & SAFETY
PART 1 - GENERAL

Provisions of the General Conditions and Special Conditions are part of this Division.

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 The Contractor shall inform him/herself of the conditions for the project, and is responsible for verifying the quantities and location of all work to be performed as outlined in this section. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract. The work of the Contract can be summarized as follows:

The work consists of the proper removal of the following approximate quantities of hazardous materials from Fine Arts Annex:

**Items considered to be Universal Waste/Hazardous Materials**

Twelve (12) window air conditioners  
Ninety three (93) fluorescent light fixtures, with their bulbs  
Two (2) external air conditioning units  
Fifty eight (58) door closers  
Seventeen (17) exit signs  
Two (2) drinking fountains  
Fourteen (14) emergency fire lights  
Five (5) smoke detectors  
Four (4) thermostats  
Four (4) large exterior lights, mounted on the outside walls of the building

1.2 CODES AND REGULATIONS:

1.1.2.1 All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

1.1.2.2 Federal and State requirements which govern universal and hazardous removal work or hauling and disposal of such waste materials include but are not limited to the following:


1.1.2.2.1.1 Construction Industry - 29 CFR 1926.1101  
1.1.2.2.1.2 Respiratory Protection – 29 CFR 1910.134  
1.1.2.2.1.3 Hazard Communication – 29 CFR 1910.1200  
1.1.2.2.1.4 Accident Prevention Signs – 29 CFR 1910.145
1.1.2.2.2 U.S. Environmental Protection Agency (EPA)

1.1.2.2.1.5 1.1.3  CONTRACTOR’S DUTIES

1.1.3.1 Except as specifically noted, provide and pay for:

- Labor, materials, and equipment.
- Tools, construction equipment, and machinery.
- Other facilities and services necessary for proper execution and completion of work.

1.1.3.2 Pay legally required sales, consumer, use, payroll, privilege and other taxes. Retail sales tax shall not be included in the bid amount.

1.1.3.3 Secure and pay for, as necessary for proper execution and completion of work, and as applicable at the time of bids:

- Permits
- Government Fees
- Licenses
- Except where specifically noted, provide and pay for waste disposal permits and costs

1.1.3.4 Give required notices.

1.1.3.5 Contractor shall assume full responsibility and liability for compliance with all codes, ordinances, rules, regulations, orders and other legal requirements of Local, State, and Federal public authorities including Environmental Protection Agency (EPA) regulations, Missouri Department of Natural Resources (MDNR) and Occupational Safety and Health Administration (OSHA) which bear on performance work. Where conflicts occur between these specifications and/or the above-mentioned regulations, the more stringent shall govern. The Contractor shall hold the owner and owner’s air monitoring firm harmless for failure to comply with any applicable work, hauling, safety, health, or other regulations on the part of the contractor, contractor’s employees, or contractor’s subcontractors.

1.1.3.6 If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify MU in writing, and any necessary changes shall be accomplished by appropriate modification. It is not the Contractor’s responsibility to make certain that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to MU, he shall assume full responsibility therefore and shall bear all cost attributable thereto.

1.1.3.7 Enforce strict discipline and good order among employees. Do not employ unfit persons or persons not skilled in assigned task.

1.1.3.8 Comply with all applicable federal, state, and local laws regarding job discrimination and payment of prevailing wage rates for the base bid.
1.1.3.9 The use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the abatement contractor.

1.1.3.10 Assume responsibility for the proper and safe execution of the work.

1.1.8 COORDINATION: The hazard remediation contractor shall be responsible for the coordination of the universal/hazardous materials removal for this project. The hazard remediation contractor shall coordinate with all other on-site contractors and all subcontractors working under separate contracts so as to facilitate the general progress of the work. Each trade shall afford all trades every reasonable opportunity for the installation of their work.

1.2 STOP WORK

1.2.1 If the Owner, or his designated representative, presents a written or verbal stop work order, immediately stop all work or that portion of the work designated. A verbal stop work order shall be confirmed by a written stop work order within 24 hours. Do not commence referenced work until authorized in writing by the Owner or his representative.

1.3 CONTRACTOR USE OF PREMISES

1.3.1 GENERAL: During the construction period for each building, the hazard remediation contractor will have full access to Fine Arts Annex for operations. Owner will keep the elevators operational.

1.3.2 USE OF THE SITE: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

1.3.2.1 Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Contractor will be allowed to use the parking lot to the north of the building for parking and/or storage of materials.

1.3.2.2 Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage to areas acceptable to Owner. If additional storage is necessary, obtain and pay for such storage off-site.

1.3.2.3 Do not load structure with weight that will endanger structure.

1.3.2.4 Assume full responsibility for protection and safekeeping of products stored on premises.

1.3.2.5 Move any stored products which interfere with operations of Owner or other contractors.
1.3.2.6 Contractor personnel shall utilize only those entrances/exits and parking lots designated by the Owner.

1.3.2.7 Contractor shall utilize only those areas designated by the Owner for the storage of equipment and the placement of dumpsters/transport containers.

1.3.2.8 Take all cautions necessary to ensure there is no universal anc hazardous material contamination to those areas not included in work schedule. Should areas outside the work area become contaminated with hazardous materials, the Contractor shall immediately clean them utilizing the wet cleaning and HEPA vacuum methods specified herein. The hazard remediation contractor is responsible for the proper cleanup of all items in the work areas to maintain a clean and safe environment.

1.3.3 **CONTRACTOR'S USE OF THE EXISTING BUILDING:** Maintain the existing building in a safe and weather tight condition throughout the construction period. Take all precautions necessary to protect the building and its occupants during the construction period.

1.3.3.1 Keep areas such as walkways and stairs free from accumulation of waste material, rubbish or construction debris.

1.3.3.2 Smoking or open fires are prohibited within the building or on the premises.

1.4 **OWNER OCCUPANCY**

1.4.1 **PARTIAL OWNER OCCUPANCY:** The Owner reserves the right to occupy areas of the building in which universal/hazardous waste removal has been completed, provided that such occupancy does not substantially interfere with completion of the work. The Owner also reserves the right to occupy portions of the building not involved in this Scope of Work. Such partial occupancy shall not constitute acceptance of the work or any part of the work. The Owner shall also maintain the right to access areas where no universal and hazardous waste work is being performed.

2.1 **SUBMITTAL REQUIREMENTS**

2.1.1 The following will be submitted by the contractor prior to commencement of work for approval by Owner’s Certified Industrial Hygienist (one copy for the Owner’s Representative). The Owner’s C.I.H. will return reviewed copies to contractor and Owner’s Representative.

2.1.1.1 One copy of any Safety Data Sheets (SDS) for products to be used by the contractor in the performance of his work. Contractor will also maintain copies of SDS on site per OSHA.

2.1.2 Submit the following for all Supervisor(s) and Workers who will be on the project site prior to commencement of work:

2.1.2.1 A list of project personnel and contact phone numbers
2.1.2.2 Current training certificates, if applicable
2.1.2.3 Physician's Statement that each person is physically fit to wear a respirator, if respirator use is required
2.1.2.4 Respirator Fit Test, if respirator use is required

2.1.3 Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification. Include in the plan the layout and location of work areas, route of ingress and egress for the work areas, methods used to assure safety of building occupants and visitors, method of removal of material, and disposal container requirements for lead based paint material to be disposed.

2.1.4 Proposed disposal site for lead-based paint materials, including a disposal plan to detail type of disposal container, method of transportation to disposal site, and waste hauler.

2.1.5 Any other submittals as required by MU.

2.1.6 Upon completion of the universal/hazardous material removal, submit to the Owner's Representative, copies of hazardous materials shipping records, disposal receipts, incineration documentation, etc. for all hazardous materials removed from the project site.

2.1.7 Upon completion of the universal waste/hazardous material removal, the following information shall be submitted by the Owner's C.I.H. to the contractor:

2.1.7.1 Construction and demolition waste landfill receipts, disposal receipts, truck tickets, incineration/recycling receipts and documentation.

2.1.7.2 Written visual certification from the Owner's Certified Industrial Hygienist that universal waste/hazardous material have been removed from the facility.

2.2 TERMINOLOGY (Definitions)

2.2.1 APPROVED Construct and Demolition WASTE DISPOSAL SITE: A permitted solid waste landfill that is authorized by the Missouri Department of Natural Resources to receive construction and demolition wastes.

2.2.2 AUTHORIZED VISITOR: The Building Owner, the Building Owner's representative, MU EHS personnel, or a representative of any regulatory or other agency having jurisdiction over the project.

2.2.3 BARRIER: Any surface that seals off the work area to non-authorized personnel

2.2.4 BUILDING OWNER: A representative of the University of Missouri.

2.2.5 DISPOSAL CONTAINER: A properly labeled container for universal/hazardous materials. The proposed disposal container for lead-based paint will be provided to the Owner's Representative and part of the hazard remediation contractor's pre-work
2.2.6 **HEPA VACUUM EQUIPMENT:** High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining hazardous particulates. Filters should be of 99.97% efficiency for retaining particulates greater than 0.3 microns.

2.2.7 **ON-SITE REPRESENTATIVE:** MU's full-time representative responsible for air monitoring and enforcement of the specifications.

2.2.8 **OWNER'S CERTIFIED INDUSTRIAL HYGIENIST:** An Industrial Hygienist, certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH).

2.2.9 **HAZARDOUS MATERIAL SHIPMENT RECORD/DISPOSAL RECEIPT:** The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of universal/hazardous materials.

2.2.10 **WET CLEANING/WIPING:** The process of eliminating contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as necessary.

2.2.11 **WORK AREA:** A specific isolated area in which universal/hazardous waste materials are required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.

2.3 **EXISTING CONDITIONS**

2.3.1 Building Owner and Contractor shall agree on building conditions prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Owner's satisfaction, prior to close-out of the project, all damaged items caused by the Contractor and not proven otherwise. All items damaged prior to remediation shall be noted during preconstruction walk-through.

3.1 **PERSONNEL PROTECTION REQUIREMENTS**

3.1.1 Prior to commencement of work, the workers shall be instructed and shall be knowledgeable on the hazards of the universal hazardous materials involved and other environmental exposures, use and fitting of respirators, protective clothing, decontamination procedures, and all aspects of remediation work procedures; workers shall have medical examinations.

3.1.2 The Contractor acknowledges that he alone is responsible for enforcing personnel protection requirements and that these specifications provide only a minimum acceptable standard for each phase of operation.

3.1.3 If required or requested of the workers, provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA.
3.1.4 No visitors shall be allowed in work areas, except as authorized.

3.1.5 Where required or if requested by the workers, provide workers with sufficient sets of disposable protective full-body clothing. Such clothing shall consist of full-body coveralls, footwear, and head gear, one-piece coveralls or equal. Provide eye protection and hard hats as required by applicable safety regulations. Disposable clothing shall not be allowed to accumulate and shall be disposed of as contaminated waste.

3.1.6 Provide authorized visitors with suitable protective clothing, headgear, footwear, and gloves as described above whenever they are required to enter the work area.

3.2 MATERIALS

3.2.1 Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

3.2.1.1 Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

3.2.1.2 Damaged or deteriorating materials shall not be used and shall be removed from the premises.

3.2.2 PLASTIC SHEETING: A minimum 6-mil (or as specified).

3.2.3 TAPE: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water, duct tape, poly prep tapes or approved equal.

3.2.4 ADHESIVES: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

3.2.5 IMPERMEABLE CONTAINERS: Suitable to receive and retain any universal hazardous materials until disposal by the owner’s rep. The containers shall be labeled as required by OSHA and DOT. Containers must be resistant to damage and rupture.

3.2.6 WARNING LABELS AND SIGNS: As required by OSHA, EPA and DOT regulations.

3.2.7 OTHER MATERIALS: Provide all other materials, such as, but not limited to lumber, plywood, nails, and hardware, which may be required to properly prepare and complete this project.

3.3 TOOLS AND EQUIPMENT

3.3.1 Provide suitable tools for universal/hazardous waste removal and disposal.

3.3.1.1 Water Sprayer: Airless or a low pressure sprayer for amended water
application as applicable.

3.3.1.2 **Air-Purifying Equipment:** High Efficiency Particulate Air Filtration Systems (HEPA) shall comply with ANSI Z9.2-91. No air movement system or air equipment should discharge particulates outside the work area. Thus, the negative air unit shall be equipped with a three filter bank with the last being the HEPA filter capable of removing 99.97% of fibers/particulates >0.3 microns.

3.3.1.3 **Scaffolding:** As required to accomplish the specified work and meet all applicable safety regulations.

2.3.1.4 **Vacuums:** Use HEPA type from a known manufacturer.

2.3.1.5 Other tools and equipment as necessary.

### 3.4 SUPERVISION OF UNIVERSAL/HAZARDOUS Material REMOVAL

3.4.1 The contractor shall designate a competent supervisor subject to the approval of the Owner’s C.I.H. and the Owner’s Representative. The supervisor shall be the Contractor’s representative on the project, shall meet the requirements of all applicable regulations, and perform or meet the following minimum requirements:

3.4.1.1 Be knowledgeable in all aspects of removal, cleanup and proper disposal of universal hazardous materials as listed in the Scope of Work.

3.4.1.2 Be onsite and supervise all removal, cleanup and disposal activities.

3.4.1.3 Maintain a daily log on the project documenting events, violations, problems, equipment failures, accidents, and inspections.

3.4.1.4 Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.

3.4.1.5 Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner’s Certified Industrial Hygienist. Inspection shall be documented.

### 3.5 WORKER PROTECTION / TRAINING

3.5.1 The contractor shall be responsible for providing his employees with proper respiratory protection, respiratory training, a written respirator program, medical examinations, maintaining medical records, protective clothing and equipment to comply with OSHA requirements, if necessary.

3.5.2 All workers shall be trained in the dangers inherent in handling universal waste, and hazardous materials, in proper work procedures, and personal protective measures.

### 3.6 OWNER’S CERTIFIED INDUSTRIAL HYGIENIST

3.6.1 It will be the Owner’s responsibility to hire a Certified Industrial Hygienist. The
Certified Industrial Hygienist will also be required to perform the following duties as a minimum:

3.6.1.1 Approval of the Contractor’s work plan and methods of remediation to meet regulatory requirements and ensure the health and safety of University faculty, staff, and students.

3.6.1.2 Verify that the Contractor is satisfactorily performing the work in accordance with OSHA regulations.

3.6.1.3 Visual inspection of the work areas.

3.6.1.4 Certify in writing that the Contractor’s procedures, methods, and practices were, to the best of his/her knowledge and belief, in compliance with current EPA, OSHA, State, and Local applicable regulations, that the work areas meet the requirements for a final visual inspection prior to re-occupancy, and an accounting of any known deviations.

3.7 SEPARATION OF WORK AREAS FROM NONWORK AREAS

3.7.1 Visual separation shall be accomplished at all “see-through” locations using opaque polyethylene. This separation shall not be incorporated within the other seals involved on this project.

3.8 EMERGENCY PROTECTION PLAN / FIRE EXITS

3.8.1 The contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan onsite. The plan shall include considerations of fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injury. All employees shall be instructed and trained in the procedures.

3.8.2 The Emergency Protection Plan shall also include written notification of police, fire, and medical personnel of the planned remediation activities, work schedule, and layout of the work area, particularly barriers that may affect response capabilities.

3.8.3 Designate and maintain emergency and fire exits from the work area in accordance with local codes and regulations. All exits shall be clearly marked with fluorescent tape or red paint and shall be clearly visible from any part of the work area.

3.9 LOCAL AREA PROTECTION / SITE SECURITY

3.9.1 The contractor shall secure the work areas to make sure of no inadvertent entry. Any breach to the exterior of the building shall be secured by the hazardous remediation contractor. The Contractor shall be responsible for maintaining security of the remediation areas throughout the contract period.

3.9.2 The contractor shall be responsible for all areas of the building used by contractor and/or subcontractors in the performance of the work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of the existing building, except such controls
as may be specifically reserved to the owner.

3.9.3 Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection, and shall require all persons in the work area to observe the same regulations required of Contractor’s employees.

3.9.4 The contractor shall have control of site security during remediation operations in order to protect the work environment and equipment. Contractor shall have the owner’s assistance in notifying building occupants of impending activity and enforcement of restricted access by owner’s employees.

3.9.5 The contractor shall keep a minimum of two (2) 10lb type ABC fire extinguishers onsite. One shall be maintained outside the work area and one inside each work area. Contractor employees shall be trained in the operation of fire extinguishers.

3.9.6 The contractor shall maintain the work area free from rubbish, debris, and dirt, and keep a clean, safe working area.

3.10 UNIVERSAL Waste HAZARDOUS MATERIALS REMOVAL OPERATIONS

3.10.1 Any light fixtures, housings, etc. concealing items considered to be universal waste/hazardous material shall be removed and left on site for disposal by MU Environmental Health and Safety. This does not include Freon containing equipment which should be managed by the contractor.

3.10.3 FLUORESCENT LIGHT TUBES may contain small amounts of Mercury. This can potentially be harmful to human health and the environment. The bulbs should be placed in fiberboard boxes provided by MU Environmental Health and Safety to minimize breakage. MU Environmental Health and Safety will manage disposal of this material.

3.10.4 POLYCHLORINATED BIPHENYL (PCBS) are a known carcinogenic material. Its use was discontinued January 1, 1979. Due to the age of the building, it should be assumed that any ballast can contain PCBs unless it is labeled as PCB free by the manufacturer. Due to this, any light ballasts presumed to contain PCBs should be properly disposed of. MU Environmental Health and Safety will provide collection container for this purpose. Non-PCB ballasts will also be managed by MU Environmental Health and Safety. Collection containers will be provided to the contractor upon their request.

3.10.5 SMOKE DETECTORS are typically ionization smoke detectors that may contain a small amount of radioactive material. MU Environmental Health and Safety will provide collection containers for this material and will also be responsible for the disposal of this material.

3.10.6 FIRE ALARMS (STROBE LIGHT) are typically not considered a universal or
hazardous waste. However, for the purposes of this project, these items should be collected by the contractor and managed by MU Environmental Health and Safety. Collection containers will be provided to the contractor upon their request.

3.10.7 **EXIT SIGNS AND EMERGENCY LIGHTS** typically have backup batteries that may contain small amounts of lead. Some exit signs are powered by a small amount of radioactive material. Powered exit signs and emergency lights should have the battery removed and disposed of by MU Environmental Health and Safety. Non powered exit signs should be assumed to contain radioactive material and should be collected for disposal via MU Environmental Health and Safety. MU Environmental Health and Safety will provide collection containers for these items.

3.10.8 **DRINKING FOUNTAINS**: Some drinking fountains have reservoirs that may contain lead and a CFC/HCFC refrigerant that must be recovered. The lead reservoirs should be removed and recycled. The CFC/HCFC refrigerant must be recovered by a contractor licensed and trained in this type of work. The remainder of the unit should be managed as scrap metal.

3.10.9 **DOOR CLOSURES**: Some of the older door closures have oil reservoirs for lubrication. These oils may contain small amounts of PCBs. MU Environmental Health and Safety will provide a collection container for this material, and will be responsible for disposal.

3.10.10 **THERMOSTATS** may contain Mercury. This can potentially be harmful to human health and the environment. Mercury containing thermostats shall be disposed of as a hazardous waste at an EPA and State approved landfill. MU Environmental Health and Safety will provide a collection container for this material, and will be responsible for disposal.

3.10.11 **WINDOW AIR CONDITIONING UNITS**: Where possible, these window units should be removed and stored for use elsewhere. Otherwise these units may contain CFC/HCFC refrigerants that must be recovered. CFC/HCFC refrigerants are suspected to damage the atmosphere. The CFC/HCFC refrigerant must be recovered by a contractor licensed and trained in this type of work. The remainder of the unit should be managed as scrap metal.

3.12 **DISPOSAL OF UNIVERSAL WASTE/HAZARDOUS MATERIALS**

3.12.1 Universal waste and hazardous materials (i.e. lead and mercury, etc.), the contractor is to properly containerize the waste and notify MU Environmental Health and Safety of the need for pickup.

3.13 **REESTABLISHMENT OF THE WORK AREA**

3.13.1 Reestablishment of the work area shall only occur after the Contractor has received a final visual inspection from the Owner’s C.I.H. documenting that the universal/hazardous waste materials have been removed from the project site.
END OF SECTION
SECTION 024116 - STRUCTURE DEMOLITION

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. Demolition and removal of buildings.
2. Abandoning in-place and Removing below-grade construction.
3. Disconnecting, capping or sealing, and abandoning in-place or removing site utilities.
4. Salvaging items for reuse by Owner.

B. Related Sections:

1. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
2. Section 017419 "Construction Waste Management & Disposal"
3. Section 020810 "Universal / Hazardous Materials Removal and Disposal"
4. Section 028233 "Fiable and Non-Fiable Asbestos Removal"
5. Section 312000 "Earth Moving"
7. Division 1 Appendix "Subsurface Investigation Report"

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner. Include fasteners or brackets needed for reattachment elsewhere.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified refrigerant recovery technician.

B. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
D. Predemolition Photographs or: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before the Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

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

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


1.6 PROJECT CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.

2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

   a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for buildings and structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: Hazardous materials are present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

E. On-site storage or sale of removed items or materials is not permitted.
PART 2 - PRODUCTS [ (Not Used)]

2.1 SOIL MATERIALS

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.

C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

C. Existing Utilities: Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

D. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

E. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to storage area designated by Owner.
5. Protect items from damage during transport and storage.
3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations.
   1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
   2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
      a. Provide at least 72 hours’ notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
   1. Protect adjacent buildings and facilities from damage due to demolition activities.
   2. Protect existing site improvements, appurtenances, and landscaping to remain.
   3. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   4. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
   2. Maintain fire watch during and for at least 24 hours after flame cutting operations.
   3. Maintain adequate ventilation when using cutting torches.
   4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, walkways, 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 authorities having jurisdiction.

C. Explosives: Use of explosives is not permitted.

3.5 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.
B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated below:
   1. Light fixtures from the Arts Annex building
   2. Electric revenue meter
   3. Existing switch to be moved to new switchgear pad north of Professional Building.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction.
   1. Remove below-grade construction, including basements, foundation walls, and footings, completely.

E. Existing Utilities: Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.

F. Existing Utilities: Demolish existing utilities and below-grade utility structures as indicted on drawings.
   1. Fill abandoned utility structures with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

G. Existing Utilities: Demolish and remove existing utilities and below-grade utility structures.
   1. Piping: Disconnect piping at unions, flanges, valves, or fittings.
   2. Wiring Ducts: Disassemble into unit lengths and remove plug-in and disconnecting devices.

3.6 SITE RESTORATION

A. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."

3.7 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.8 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Do not burn demolished materials.
3.9 CLEANING

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

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116
PART 1 - GENERAL

Provisions of the General Conditions and Special Conditions are part of this Division.

1.1 SCOPE OF WORK

1. General: The work specified herein shall be the abatement of asbestos containing materials by certified and registered persons who are knowledgeable, qualified and trained in the abatement, handling, and disposal of asbestos containing material, and subsequent cleaning of the affected environment.

2. The Contractor shall furnish all labor, material, equipment, testing, services, permits, insurance, notifications, necessary or required to perform the work in accordance with applicable local, state, and federal regulations for the abatement of asbestos containing materials and for other work as specified in this section or as indicated in associated drawings, sketches, or reports of the work.

All fees required for notification requirements, renotifications, and/or inspections by the regulatory agencies shall be paid by the Contractor. Bulk sample analysis information required by the Department of Natural Resources, U.S. Environmental Protection Agency or local authority having jurisdiction in conjunction with the notification shall also be provided by the Contractor unless provided within this section.

3. The work shall include the removal and legal disposal of friable and non-friable asbestos containing materials including.

Non-friable asbestos:
The contractor shall remove and legally dispose of:
1. Six hundred eighty three (683) square feet of ACM flooring system, consisting of floor tile, mastic, and potentially, leveler
2. Fifty six (56) windows- Window glazing compound on these windows contains asbestos. Rather than stripping the windows, the most efficient way to remove the ACM is to remove the windows and dispose of the intact units as ACM.
   There are: (15) 20x40 approximately
   (6) 36x48
   (4) 60x72
   (13) 36x60
   (9) 32x34
   (5) 48x84
   (4) 48x48 windows
3. Fifty five (55) fire doors
4. One thousand five (1005) square feet of ACM roofing felts
5. Ten (10) square feet of waterproofing patch from the exterior of the concrete foundation. Additional waterproofing membrane may be exposed as the foundation is uncovered.
1.2 DEFINITIONS

1. Abatement - Procedures to decrease or eliminate the source of fiber release from asbestos containing building materials. Includes encapsulation, enclosure, and removal.

2. Adequately Wet - To sufficiently mix or penetrate with liquid to prevent the release of particulate.

3. Aggressive Air Sampling - Sweeping of floors, ceilings and walls and other surfaces with the exhaust of a minimum of one (1) horsepower leaf blower or equivalent immediately prior to air monitoring.

4. Approved Waste Disposal Site - A solid waste disposal area that is authorized by the Department of Natural Resources to receive asbestos containing solid wastes.

5. Asbestos - The asbestiform varieties of serpentine (chrysotile, antigorite), riebeckite (crocidolite), cummintonite-grumerite (amosite), anthophyllite, and actinolite-tremolite.

6. Asbestos Abatement Supervisor - An individual who directs, controls, or supervises others in asbestos abatement projects.

7. Asbestos Containing Building Material (ACBM) - Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

8. Asbestos Containing Material (ACM) - Any material containing more than 1 percent asbestos by weight.

9. Barrier - Any surface that seals off the work area to inhibit the movement of fibers.

10. Category I Nonfriable ACM - Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one percent (1%) asbestos as determined using the method specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy.

11. Category II Nonfriable ACM - Any material, excluding category I nonfriable ACM, containing more than one percent (1%) asbestos as determined using the methods specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

12. Containment - Area where asbestos abatement project is conducted. Area must be enclosed either by a glove bag or plastic sheeting barrier.

13. Contractor’s Competent Person (Qualified Person) - One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate
control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I, II, III, and IV work, who is specially trained in training courses which meet the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for project designer or supervisor, or its equivalent.

14. Decontamination Area - Enclosed area adjacent and connected to the regulated area which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos.

15. Demolition - the wrecking or taking out of any load bearing structural member of a facility together with any related handling operations.

16. Disposal Bag - A properly labeled 6 mil. thick leak-tight plastic bag used for transporting asbestos waste from work area to disposal site.

17. Encapsulant (Sealant) - A liquid material which can be applied to asbestos-containing material and which prevents the release of asbestos fibers from the material either by creating a membrane over the surface or by penetrating into the material and binding its components together.


19. Enclosure - The construction of an airtight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.

20. Friable Asbestos Material - Any material containing more than one percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

21. Glove Bag - A manufactured or fabricated device, typically constructed of six (6) mil transparent polyethylene or polyvinyl chloride plastic. This device consist of two (2) inward projecting long sleeves, an internal tool pouch and an attached, labeled receptacle for asbestos waste.

22. Homogeneous Work Site - Continuous areas with the same type of ACM and in which one type of abatement process is performed.

23. Negative Initial Exposure Assessment - An assessment by a "Competent Person" in which it is concluded that employee exposures during the job are likely to be consistently below the Permissible Exposure Levels.

24. Outside Air - Air outside of the containment.

25. Owner's Air Monitoring Firm - Air Monitoring conducted by a person who is not under the direct control of the person carrying out the asbestos abatement project and who has been selected by the Owner.

26. Owner's Air Sampling Professional - An individual who holds a valid certification from the State of Missouri. The individual shall conduct, oversee, or be responsible for air
monitoring of asbestos abatement projects before, during, and after the project has been completed. The air sampling professional must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and supervised by the Owner's Certified Industrial Hygienist (C.I.H.).

27. Owner's Air Sampling Technician - An individual who has been trained by and is under the supervision of an air sampling professional to do air monitoring before, during, and after the asbestos abatement project. The air sampling technician must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and be supervised by the Owner's Certified Industrial Hygienist (C.I.H.).

28. Owner's Certified Industrial Hygienist (C.I.H.) - an Industrial Hygienist, Certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Owner's C.I.H. must also be certified by the Missouri Department of Natural Resources as an air sampling professional and hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate. The Owner will identify C.I.H. before application for permit.

29. Personal Monitoring - Sampling of the asbestos fiber concentrations within the breathing zone.

30. Regulated Asbestos Containing Material (RACM) - Friable asbestos material; Category I nonfibrous ACM that has become friable; Category I nonfibrous ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; Category II nonfibrous ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

31. Remove - To take out RACM or facility components that contain or are covered with RACM from any facility.

32. Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component.

33. Repair - The restoration of asbestos material that has been damaged. Repair consists of the application of rewettable glass cloth, canvas, cement or other suitable material. It may also involve filling damaged areas with non-asbestos substitutes and re-encapsulating or painting previously encapsulated materials.

34. Strip - To take off RACM from any part of a facility or facility components.

35. Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos containing waste material.

36. Work Area - A specific isolated area, other than the space enclosed within a glove bag, in which friable asbestos-containing materials is required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.
1.3 CODES AND REGULATIONS

1. General Applicability Of Codes, Regulations and Standards - All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

2. Contractor Responsibility - The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to work practices, hauling, disposal and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold the owner harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulations on the part of the contractor, contractor's employees, or contractor's subcontractors.

3. Federal and State requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:


2. U.S. Environmental Protection Agency (EPA) including but not limited to:


3. U.S. Department of Transportation (DOT) including but not limited to:

4. State of Missouri including but not limited to:

   1. H.B. 77, 85th General Assembly.

   2. Missouri Air Conservation Law Chapter 643.

   3. Missouri Department of Natural Resources, Division 10, Chapter 6 of the Code of State Regulations as follows:

      (1) 10 CSR 10-6.020, Definitions

      (2) 10 CSR 10-6.080, Emission Standards for Hazardous Air Pollutants

      (3) 10 CSR 10-6.230, Administrative Penalties

      (4) Volume 18, Missouri Register, Page 44

      (5) 10 CSR 10-6.250, Asbestos Abatement Projects - Certification, Accreditation, and Business Exemption Requirements

1.4 NOTIFICATIONS

1. Notifications meeting the requirements of Volume 18, Missouri Register, page 44, shall be completed and sent by the Contractor not less than ten (10) days before the intended starting date of the project. Send notification to the following:

   1. Department of Natural Resources
      Air Pollution Control Program (Asbestos)
      P.O. Box 176
      Jefferson City, Missouri 65102

   2. U.S. Environmental Protection Agency
      Region VII
      Air & Toxic Division, Air Branch
      ATTN: Air Compliance
      726 Minnesota Avenue
      Kansas City, Kansas 66101

   3. Provide a copy to the Owner's Representative. Five (5) day notification to the Owner's Representative is required on jobs less than the reportable quantity.

   4. If the project is under the jurisdiction of the Kansas City Air Quality Section, St. Louis County Air Pollution Control Branch, or the Springfield-Green County Air Pollution Control Authority, send notification directly to the appropriate agency.
1.5 SUBMITTALS

1. The following will be submitted by contractor prior to commencement of work for approval by the Owner’s Certified Industrial Hygienist (one copy for the Owner's Representative). Owner's C.I.H. will return reviewed copies to contractor and Owner's Representative.

1. One copy of material safety data sheets (MSDS) for products to be used by the Contractor in the performance of his work. Contractor will also maintain copies of MSDS on site per OSHA.

2. One copy of the notifications to, or any correspondence with, the regulatory agencies. Submit a listing of all prior regulatory violations.

2. Friable Abatement:

1. Current Certificates of training and statement of qualifications for the project asbestos abatement supervisor and the Missouri Asbestos Occupational Certificates for all project personnel. List a summary of project personnel and contact phone numbers.

2. Name, address, and contact person's name of testing laboratory or laboratories to be utilized analyzing samples for bulk analysis or air samples.

3. Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification and Volume 18, Missouri Register, page 44, and 29 CFR 1926.1101. Include in the plan the layout and location of barriers, decontamination units, route of ingress and egress for work area, methods used to assure safety of building occupants and visitors, methods used to isolate or closing out of HVAC system, personal air monitoring strategy, method of removal of material, and engineering controls utilized to prevent emissions from the work area.

4. Provide a disposal plan to detail type of disposal container, method of transportation to disposal site, waste hauler, and disposal site.

5. Copy of notifications required as part of the emergency notification plan.

3. Non-Friable Abatement:

1. Submit a detailed plan of the procedures proposed to minimize emissions and to prevent the material from becoming friable during removal.

2. Copy of emergency protection plan to be used if the nonfriable material should become friable during removal.

3. Current Certificates of training and statement of qualifications for the "Competent Person".

4. One copy of the Negative Initial Exposure Assessment.
4. Upon completion of the abatement work, the following information shall be submitted to the Owner's Representative.

   1. Waste disposal receipts and waste shipment record on all asbestos waste removed from the project.

5. Upon completion of the abatement work, the following information shall be submitted by the Owner's C.I.H. to the Contractor.

   1. Air sampling test results for personal (non-OSHA) and final clearance air samples taken under the supervision of Owner's Certified Industrial Hygienist. Results must be in writing in final report form.

   2. Written certification from the Owner's Certified Industrial Hygienist.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 SUPERVISION OF ABATEMENT

   1. The Contractor shall designate a competent supervisor subject to the approval of the Owner's C.I.H. and the Owner's Representative. The supervisor shall be the Contractor's representative on the project and shall meet the requirements of all applicable regulations and perform the following minimum requirements.

      1. Be Certified by the State of Missouri as an Asbestos Abatement Supervisor, a minimum of one year prior full time experience in asbestos abatement work and a minimum of two years experience as a supervisor, and be qualified as a Competent Person in accordance with OSHA regulation 1926.1101.

      2. Be on site and supervise all abatement work in accordance with OSHA and Volume 18, Missouri Register, page 44.

      3. Conduct all OSHA required air monitoring.

      4. Maintain a daily log on the project documenting events, visitations, problems, equipment failures, accidents, and inspections.

      5. Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.

      6. Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner's Certified Industrial Hygienist. Inspection shall be documented.
3.2 NEGATIVE INITIAL EXPOSURE ASSESSMENT

1. The Contractor must conduct a Negative Initial Exposure Assessment (non-friable asbestos) prior to removal of the asbestos material. The Negative Initial Exposure Assessment shall be performed by a "Competent Person" to determine whether the material may be removed and maintained in a nonfriable condition. If the material cannot be removed without becoming friable then the contractor shall comply to the requirements in this specification at no additional cost to the Owner.

2. The method of removal is the Contractor's option. However, in the event of any of the following:

   1. Visible emissions are observed
   2. Sanding, grinding, cutting, or abrading of the material
   3. Air samples exceed 0.1 f/cc

   The contractor shall immediately stop work, implement corrective work practices, make any necessary notifications to all regulatory agencies of the changes in work practices and material conditions, and comply with the requirements as set forth in this specification.

3.3 WORKER PROTECTION & TRAINING

1. The Contractor shall be responsible for providing his employees with proper respiratory protection, respiratory training, written respirator program, medical examinations, maintaining medical records, and protective clothing and equipment to comply with OSHA requirements.

2. The Contractor shall be responsible for all testing and costs incurred for complying with requirements of OSHA regulations for Personal Air Sampling.

3. All workers shall be trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and protective measures.

4. All workers shall hold valid diplomas as accredited Asbestos Abatement Workers as required by 10 CSR 10-6.250.

3.4 INDEPENDENT TESTING LABORATORY

1. Testing Laboratories utilized by the Contractor for sample analysis during the project shall meet the following minimum requirements and be approved by the Owner's C.I.H. This information shall be submitted to the Owner’s Representative for review.
1. All air monitoring samples shall be analyzed by a testing laboratory accredited by the American Industrial Hygiene Association (AIHA) or by an individual who is currently on the Asbestos Analyst Registry.

2. All bulk samples shall be analyzed by a testing laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

3.5 OWNER’S AIR SAMPLING PROFESSIONAL & CERTIFIED INDUSTRIAL HYGIENIST

1. It will be the Owner's responsibility to hire an Air Sampling Professional & Certified Industrial Hygienist. The Air Sampling Professional & Industrial Hygienist will also be required to perform the following duties as a minimum:

   1. Approval of the Contractor's work plan and methods of abatement to meet regulatory requirements and ensure the health and safety of University faculty, staff, and students.

   2. Verify that the contractor is satisfactorily performing personal air monitoring as directed by OSHA regulations.

   3. Visual inspection of the work area and final clearance air monitoring.

   4. Certify in writing that the Contractor's procedures, methods and practices were, to the best of my knowledge and belief, in compliance with current EPA, OSHA, State and/or applicable local regulations and that the work areas meet the requirements for final clearance testing and account of any known deviations.

   5. Issue final air clearance.

3.6 EMERGENCY PROTECTION PLAN

1. The contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan on site. The plan shall include considerations of asbestos leakage from the site, fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injury. All employees shall be instructed and trained in the procedures.

2. Emergency protection plan shall also include written notification of police, fire and medical personnel of the planned abatement activities, work schedule, and layout of work area, particularly barriers that may affect response capabilities.

3.7 LOCAL AREA PROTECTION & SITE SECURITY

1. The contractor shall be responsible for all areas of the building used by him and/or subcontractors in the performance of the work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of the existing building, except such controls as may be specifically reserved to the owner.
2. Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection, and shall require all persons in the work area to observe the same regulations required of Contractor’s employees.

3. The contractor shall have control of site security during abatement operations in order to protect work environment and equipment. Contractor shall have the owners assistance in notifying building occupants of impending activity and enforcement of restricted access by owners employees.

4. The contractor shall keep a minimum of two 10 lbs. type ABC fire extinguishers on site. One shall be maintained outside the work area and one inside the work area. The employees shall be trained in the operation of extinguishers.

5. Where areas cannot be isolated by existing walls and doors from employees, clients, or the public, barriers must be constructed of 1/2” plywood and 2”x4” framing 16” o.c. to isolate the area. The barriers must be installed in such a manner to prevent damage to existing walls, floors, or ceilings. Barrier may have a lockable door.

6. The contractor shall maintain the work area free from rubbish, debris, and dirt and keep a clean, safe working area.

7. The Contractor shall provide warning signage around the regulated area as required by OSHA.

8. The Contractor shall isolate any and all air supply and returns to the abatement space as required by OSHA. Contractor shall coordinate with the Owner’s Representative.

9. The Contractor shall keep all areas where adhesive stripper is in use (such as mastic removal) under negative pressure and exhausted to the outside ambient air.

3.8 FINAL CLEARANCE REQUIREMENTS (FRIABLE ASBESTOS)

1. Upon completion of the abatement work, the supervisor shall perform a visual inspection of the work area. If satisfactory, the supervisor shall then request the Owner's C.I.H. or the C.I.H.’s air sampling technician to perform a visual inspection. When the Owner's C.I.H. feels the area is ready based on the results of their visual inspection, the Contractor shall apply a lockdown encapsulant. Following application of lockdown encapsulant, the Owner's C.I.H. shall perform the final clearance sampling for airborne fiber concentrations.

2. The Owner's C.I.H. or designee will perform final clearance testing per the following requirements:

   1. Aggressive sampling shall be required for all areas where removal has taken place with the exception of glove bag projects where nonaggressive sampling is permitted.

   2. P.C.M. samples analyzed on site shall be counted by an accredited registered microscopist.
3. For areas specifically specified for clearance by Transmission Electron Microscopy, the method shall be NIOSH 7402.

3. Any work areas failing to meet the clearance requirements of this section shall be recleaned and retested at the contractor’s expense until satisfactory levels are obtained.

4. The Owner's C.I.H. shall provide a written report of the air monitoring activities to the contractor within 7 days after the final clearance testing.

3.9 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

1. Reestablishment of the work area shall only occur after the contractor has received final clearance in writing from the Owner's C.I.H.

2. All damage to finishes, equipment, and/or the area affected by the abatement shall be repaired by the contractor to equal or better condition as it was prior to the work, at no cost to the owner.

3.10 WASTE DISPOSAL

1. All asbestos containing waste and/or asbestos contaminated debris shall as a minimum be double bagged in approved 6 mil. disposal bags. Each bag shall be tagged to meet requirements of NESHAPS with an asbestos caution label and a source identification label.

2. Transportation shall meet the requirements of all regulatory agencies for asbestos containing materials and shall be transported in an enclosed truck.

3. The waste disposal site shall be approved by the Missouri Department of Natural Resources for asbestos disposal. A chain of custody letter/waste shipment record and disposal receipts shall be provided to the owner for all materials disposed of.

3.11 DRAWINGS

1. Drawings, when provided, are not intended to be used for anything but a "reference" to the work area. Information is not specific to quantities or to exact location of ACM unless explicitly noted. Contractor will be required to field verify the conditions and quantities.

3.12 REPORTS

1. Reports, when provided, are intended to be used as a basis for the type and composition of the asbestos present for both bidding purposes and for the information required for the notifications to the governing agencies.
LIMITED RCRA METALS IN PAINT SURVEY

For the

MU PROJECT # CP170621 – Fine Arts Annex Building Demolition

UNIVERSITY OF MISSOURI - COLUMBIA

Prepared for

UNIVERSITY OF MISSOURI - COLUMBIA
CAMPUS FACILITIES
COLUMBIA, MISSOURI 65211

Prepared by

University of Missouri
Environmental Health & Safety
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1. Introduction

EHS has performed a limited Resource Conservation and Recovery Act (RCRA) 8 metals in paint survey in general accordance with the original agreement for Project # CP170621– Fine Arts Annex Building Demolition.

1.1 DESCRIPTION OF SURVEY AREA

This project included University of Missouri’s Fine Arts Annex Building year of construction 1945 consisting of approximately 15,564.05 square feet of floor space. The building is brick construction.

*Note: Because of this building was purchased by the University of Missouri, there are no architectural records of its original construction on file.*

1.2 PURPOSE OF SURVEY

The purpose of this limited RCRA metals in paint survey was to provide information regarding the presence of the following metals on tested components within the Fine Arts Annex: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. Tested components were those materials that might potentially be reused as clean fill after the building is demolished. This limited survey was not intended to meet the strict requirements of the U.S. Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the U.S. Department of Housing and Urban Development (HUD), or State regulatory requirements, except for licensing (if applicable).

2. Methodology

2.1 FIELD TESTING

Environmental Health and Safety utilized a Thermo Scientific Niton XL2 GOLDD X-Ray Fluorescence Analyzer to determine the presence and amount of arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver (collectively known as the RCRA 8 Metals) in painted components in the building that might be potentially reused as clean fill. This device was used to test for the required parameters and to provide the needed detection limits. This device provided real-time data regarding the presence of the RCRA metals tested.

Testing was performed so that there was a minimum of one (1) test for a maximum of approximately 5,000 square feet of a particular painted component.
3 Findings

3.1 FIELD TESTING

Some of the painted items tested by the XL2 XRF contained the metals of concern at or above the concentrations specified in the Missouri Department of Natural Resources (MDNR) Solid Waste Management Program document titled “Using Painted Block and Brick as Clean Fill”, updated January 31, 2003. The maximum concentration of the RCRA metal in paint allowed for clean fill are equal to or below the levels listed:

- Silver (Ag): 99 parts per million (ppm);
- Arsenic (As): 87 ppm;
- Barium (Ba): 15,200 ppm;
- Cadmium (Cd): 429 ppm;
- Chromium (Cr): 3,285 ppm;
- Lead (Pb): 4,999 *ppm
- Mercury (Hg): 100 ppm; and
- Selenium (Se): 50 ppm.

*Lead based paint is defined as paint containing at least 5,000 ppm lead or 0.5% lead. Material painted with lead based paint may not be used as clean fill. Material coated with paint containing up to 4,999 ppm lead may still be used as clean fill.

The items that were found to contain elevated RCRA metals compared to the above listed concentrations included some metal components and asphalt. Detailed information may be found in Table 1 located in Appendix A.

Although a few areas had RCRA metals above the MDNR Clean Fill allowable levels, it should be noted that the majority of these components had concentrations below the maximum levels.

3.2 CONCLUSIONS

Based on the sample results shown on the appended tables, none of the yellow brick walls tested in the Survey Area contain heavy metals above the MDNR's "Using Painted Block and Brick as Clean Fill" document. This survey is to be used in addition to the Lead Paint Survey conducted by EH&S throughout the Survey Area. Lead-based paint was found on painted metal window frames, wood trim, painted wood doors, in the Survey Area. Based on this information EH&S recommends that the exterior brick walls may be used as clean fill.
TABLE 1
RCRA METAL TEST DATA RESULTS
PROJECT NUMBER CP170621
University of Missouri-Columbia
Fine Arts Annex Building Demolition

<table>
<thead>
<tr>
<th>Test Number</th>
<th>Ag</th>
<th>As</th>
<th>Ba</th>
<th>Cd</th>
<th>Cr</th>
<th>Hg</th>
<th>Pb</th>
<th>Se</th>
<th>Test Result</th>
<th>Interior (I) or Exterior (E)</th>
<th>Room Number</th>
<th>Wall</th>
<th>Component</th>
<th>Substrate</th>
<th>Paint Color</th>
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<td>&lt;LOD</td>
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<td>Interior Vestibule V100</td>
<td>West</td>
<td>Wall</td>
<td>Plaster</td>
<td>Lt. tan</td>
<td></td>
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<tr>
<td>2</td>
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<td>31</td>
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<td>&lt;LOD</td>
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<td>North</td>
<td>Wall</td>
<td>Plaster</td>
<td>Lt. yellow</td>
<td></td>
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<tr>
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<td>32</td>
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<td>Interior Room 21</td>
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<td>Lt. green</td>
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<td>&lt;LOD</td>
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<td>Floor</td>
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<td>Interior Room 11</td>
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<td></td>
</tr>
<tr>
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<td>Interior Corridor C000W</td>
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<td>yellow</td>
<td></td>
</tr>
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<td>yellow</td>
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<td>Ba</td>
<td>Cd</td>
<td>Cr</td>
<td>Hg</td>
<td>Pb</td>
<td>Se</td>
<td>Test Result</td>
<td>Interior (I) or Exterior (E)</td>
<td>Room Number</td>
<td>Wall</td>
<td>Component</td>
<td>Substrate</td>
<td>Paint Color</td>
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<td>&lt;LOD</td>
<td>&lt;LOD</td>
<td>&lt;LOD</td>
<td>Not Above MDNR Clean Fill Policy</td>
<td>Interior</td>
<td>Corridor C100C</td>
<td>West</td>
<td>ceiling</td>
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<td>&lt;LOD</td>
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<td>39</td>
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<td>Exterior of room 120C</td>
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<td>wall</td>
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<td>Balcony</td>
<td>South</td>
<td>wall</td>
<td>Brick</td>
<td>Lt. Brown</td>
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<td>wall</td>
<td>Brick</td>
<td>Lt. Brown</td>
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<td>&lt;LOD</td>
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<td>Exterior</td>
<td>Beneath wood deck</td>
<td>Ground</td>
<td>Asphalt</td>
<td>Asphalt</td>
<td>Black</td>
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</tbody>
</table>
Appendix B Personal Certificates
STATE OF MISSOURI
DEPARTMENT OF HEALTH AND SENIOR SERVICES

LEAD OCCUPATION LICENSE REGISTRATION

Issued to:

Rudy Zachary

The person, firm or corporation whose name appears on this certificate has fulfilled the requirements for licensure as set forth in the Missouri Revised Statutes 701.300-701.338, as long as not suspended or revoked, and is hereby authorized to engage in the activity listed below.

Lead Inspector
Category of License

Issuance Date: 12/20/2016
Expiration Date: 12/20/2018
License Number: 101220-300003103

Peter Lyskowski
Director
Department of Health and Senior Services

Lead Licensing Program, PO Box 570, Jefferson City, MO 65102
We have all seen signs posted at construction sites advertising the need for “clean fill”, and probably have given the term little thought. Simply put, clean fill is material used to bring a site to a desired elevation or grade, often to provide a firm base for building or parking lot construction. What most people don’t realize is that there is a legal definition of clean fill. The Missouri Solid Waste Management Law defines clean fill as:

Uncontaminated soil, rock, sand, gravel, concrete, asphaltic concrete, cinder blocks, brick minimal amounts of wood and metal, and inert solids as approved by rule or policy of the department for fill, reclamation or other beneficial uses.

By far the most frequently asked question regarding clean fill is the meaning of the term ‘uncontaminated.’ There is really no question as to whether virgin natural materials such as soil, sand, and gravel should be used as clean fill. Material that meets this definition may be used as fill in nearly any capacity you chose as long as you don’t place it in wetlands, floodplains, or classified waterways without permission from the proper authorities. However, there are some questions surrounding the use of demolition debris such as asphalt, concrete, concrete blocks, and bricks as clean fill, particularly when the material has been painted. Under no circumstances should demolition debris, painted or unpainted, be placed directly in contact with water bodies such as lakes, streams, or rivers. However, if the demolition material described above is clean and unpainted, it is also for more or less unrestricted use.

In January, 2001, the department’s technical bulletin titled Managing Construction and Demolition Waste was revised to allow the use of painted demolition debris to be used as clean fill as long as the paint itself is not a heavy metal based paint. Though our policy concerning the use of painted material as clean fill has not yet been fully developed, certain aspects have been determined at this point. Please understand that we consider this policy to be a work in progress, and intend to develop a workable, practical approach to this issue that is protective of the environment. This guidance document outlines the department’s policy to date.

**What is a heavy metal?**

The department has determined that the heavy metals of concern are the eight (8) metals listed in the Code of Federal Regulations, 40 CFR Part 261, Table 1 – Maximum Concentration of Contaminants for the Toxicity Characteristic. These metals are commonly referred to as the Resource Conservation and Recovery Act (RCRA) metals. They are:

arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver.
What testing is required?

Testing can be done either by wet chemistry (total concentration analysis) or by using an x-ray fluorescence (XRF) instrument. Most laboratories in the state are able to routinely perform wet chemistry testing. Acceptable test methods we have seen to date include Environmental Protection Agency (EPA) SW 846, Methods 6010B and 3050B. The sample must be of the paint only, and cannot include the substrate. The results are normally reported in milligrams per kilogram (mg/kg) which is equivalent to parts per million (ppm). Laboratory reports must be included if the information is submitted to the department. Make sure the laboratory report indicates the detection limit of the test method.

XRF testing is more specialized and usually requires that you hire an experienced consultant. We are still learning about this process. However, based on the limited data we have seen to date, we have determined that for XRF testing a detailed report must be submitted containing the following information:

- A printout or summary of the test results
- Color of paint
- Type of paint if known (latex, oil based enamel, etc.)
- Number of coats of paint
- Type of substrate (bricks, concrete, concrete block, etc.)
- Type of application (interior vs. exterior)
- Relative roughness of the surface
- Test detection limits and how they were derived
- Exposure times
- Other factors affecting the interpretation of the results, as specified by the instrument manufacturer

What testing frequency should I use?

Regardless of the testing method or the size of the building, the department requires a minimum of one (1) test for each type and color of paint present in each building. Should a particular color or type of paint be present in quantities greater than approximately 5,000 square feet of surface area, one sample of the paint for every 5,000 square feet of painted surface, or fraction thereof, must be collected. In other words, if there are 6,500 square feet of painted surface area painted with a particular color of paint, two (2) tests are required. For 14,000 square feet, three (3) tests are required, and so on.

When is a paint a heavy metal based paint?

Lead based paint is defined as paint that contains:

- One milligram of lead per square centimeter of surface area, or
- One half of one percent (0.5%) lead (equal to five thousand (5,000) ppm)
This definition is well established, and is used by Housing and Urban Development (HUD) and the Environmental Protection Agency (EPA). No material painted with lead based paint may be used as clean fill, regardless of its origin.

We are not aware that there are any other defined heavy metal based paints. This determination will be made by the department on a case by case basis.

**Are there different requirements for residential structures vs. non-residential structures?**

Yes. For the purposes of this guidance document, residential structures are defined as single family dwellings and multi-family dwellings of up to four family units. For residential structures, lead is the only metal of concern. Testing for other RCRA metals is not necessary. In other words, for residential structures, you must only determine whether the material is painted with lead based paint. If it is not, then material that would otherwise be clean fill may still be used as such. While you should keep the test results in your records, you do not have to submit them to the department for approval.

For non-residential structures, you must test for all eight RCRA metals. As for residential structures, material painted with lead based paint is not acceptable for use as clean fill. However, we have not yet determined the levels of other RCRA metals that classify them as heavy metal based paints. In other words, the acceptable maximum levels for the other RCRA metals in paint on clean fill material from non-residential structures has not yet been determined. However, Table 1, below, gives the maximum levels of RCRA metals in paint on clean fill that have been approved to date. We consider the painted material to be clean fill if testing reveals that the concentrations of RCRA metals in the paint are equal to or below these levels:

**Table 1**

<table>
<thead>
<tr>
<th></th>
<th>As</th>
<th>Ba</th>
<th>Cd</th>
<th>Cr</th>
<th>Pb</th>
<th>Hg</th>
<th>Se</th>
<th>Ag</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum approved Levels, ppm</strong></td>
<td>87</td>
<td>15,200</td>
<td>429</td>
<td>3,285</td>
<td>4,999*</td>
<td>100</td>
<td>50</td>
<td>99</td>
</tr>
</tbody>
</table>

* ‘Lead-based paint’ is defined as paint containing at least 5,000 ppm lead, or 0.5% lead. Material painted with lead based paint may not be used as clean fill. Material coated with paint containing up to 4,999 ppm lead may still be used as clean fill.

If testing reveals that the levels of metal in the paint are below the levels in the table, you may use the material as clean fill without submitting the test results to the department. Keep the test results for your records. If the levels of metal in the paint are above the levels in the table and you still wish to pursue its use as clean fill, you may elect to perform further testing using the
synthetic precipitation leaching procedure (SPLP) test, EPA SW 846, Method 1312, on the paint (with no substrate included). This additional testing is only necessary for those metals found to be above the appropriate levels in Table 1, above. Compare the test results to the water quality standards in the Missouri State Code of Regulations, 10 CSR 20-7, Table A – Criteria for Designated Uses. This table may be viewed by visiting the Missouri Secretary of State’s website at following address:

http://www.sos.state.mo.us/adrules/csr/current/10csr/10c20-7b.pdf

If SPLP testing reveals that the concentration of the particular metal in the extract of the material is below the water quality standards for that metal, the material is clean fill. In other words, if the metal doesn’t leach out above the lowest water quality standard in Table A using the SPLP, it is clean fill. Again, the test results should be kept in your records, but they do not have to be submitted.

If XRF or wet chemistry testing reveals that the concentration of any RCRA metal in the paint, other than lead, is at or above the level for the metal in the table, and you do not wish to perform the additional SPLP tests, the XRF or wet chemistry results must be submitted to the department’s SWMP for review. The allowable maximum levels for RCRA metals, other than lead, in paint on clean fill material, will be determined on a case-by-case basis for the immediate future. Table 1 will be revised accordingly as these determinations are made. To reiterate, the maximum level for lead is always the HUD definition of lead based paint, regardless of whether the structure is residential or not.

These procedures are subject to change as data becomes available regarding the metal content and the leachability of metals in paint. Any data you might have in your possession concerning the metal content of paint will assist us in our efforts; we will welcome copies of any test results you may have.

If you have any further questions, please feel free to contact the Special Projects Unit staff at (573) 751-5401.
LEAD SURVEY REPORT
PROJECT 170621
FINE ARTS ANNEX

TO: Pam Eugster
Planning, Design, and Construction

FROM: Pete Kohler
Environmental Health and Safety

MU EHS has completed a lead survey of Fine Arts Annex. The purpose of this survey is to identify lead paint that might represent a potential worker safety hazard and/or might require special handling and waste disposal prior to the demolition of the building.

The EPA and the U.S. Department of Housing and Urban Development (HUD) consider lead-based paint as containing a lead concentration equal to or greater than 1.0 milligram per square centimeter (mg/cm²) or 0.5% lead by weight, as defined by Title X of the 1992 Housing and Community Development Act. The US Consumer Product Safety Commission considers paint with up to 600 ppm of lead to be “Lead Free”.

Finished surfaces were tested for lead, using a Niton XL2 analyzer. The analyzer was checked before and after each session of the survey and found to be in calibration. The survey was made by Pete Kohler (Missouri Lead Inspector #00783, expires 5/17/17.) The lead survey was conducted in November, 2016.

As a result of the survey, lead-based paint was identified.

OSHA has found that certain work, including aggressive disturbance of the painted surface, may result in lead levels exceeding the Action Level or the Permissible Exposure Limit (PEL); even when the concentration is below 1 mg/cm².
# LEAD SAMPLING TABLE

**PROJECT CP170621**  
**FINE ARTS ANNEX**

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<tr>
<th>LOCATION/DESCRIPTION</th>
<th>LEAD READINGS (mg/cm²)</th>
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<td>007, tan plaster walls</td>
<td>0.08, 0.04, 0.02</td>
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<td>007, red plaster walls</td>
<td>0.02, 0.01</td>
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<td>007, west wall, behind sink, tan plaster wall</td>
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<tr>
<td>007A, blue wood door</td>
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</tr>
<tr>
<td>Janitor’s closet 010, blue wood door</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Corridor C000W, yellow plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>C000W, brown metal doors</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>C000W, brown metal door frames</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Room 004, white plaster walls</td>
<td>0.01, 0.02, 0.01</td>
</tr>
<tr>
<td>004, brown metal heater covers</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>003, brown metal door</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>002, black walls (sheet rock and plaster)</td>
<td>0.05, 0.08, 0.02, 0.01, 0.01, 0.05</td>
</tr>
<tr>
<td>002, black concrete floor</td>
<td>0.02, 0.01, 0.01</td>
</tr>
<tr>
<td>002, black ceiling</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Mechanical Room 011 has stone foundation walls and bare cinder block walls, a concrete floor and ceiling, with no finished surfaces. Just inside entry door frame, small section of painted concrete wall</td>
<td>0.07, 0.07</td>
</tr>
<tr>
<td>Corridor C000, yellow plaster walls</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>C000, brown metal doors</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>C000, brown metal door frames</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Location</td>
<td>Material</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Stairs S000S, yellow plaster</td>
<td>Walls</td>
</tr>
<tr>
<td>000S, brown metal newel post</td>
<td></td>
</tr>
<tr>
<td>000S, brown metal hand rail</td>
<td></td>
</tr>
<tr>
<td>000S, brown metal stair stringer</td>
<td></td>
</tr>
<tr>
<td>Mech. Room 011, brown metal</td>
<td></td>
</tr>
<tr>
<td>door</td>
<td></td>
</tr>
<tr>
<td>Entry to back hallway, blue</td>
<td></td>
</tr>
<tr>
<td>metal door</td>
<td></td>
</tr>
<tr>
<td>Corridor C000N, white sheet</td>
<td>Rock walls</td>
</tr>
<tr>
<td>Office 014, white walls</td>
<td></td>
</tr>
<tr>
<td>014, blue wood windows</td>
<td></td>
</tr>
<tr>
<td>014, blue wood door</td>
<td></td>
</tr>
<tr>
<td>Office 015, blue wood door</td>
<td></td>
</tr>
<tr>
<td>015, white walls</td>
<td></td>
</tr>
<tr>
<td>015, blue wood windows</td>
<td></td>
</tr>
<tr>
<td>Office 016, light gray walls</td>
<td></td>
</tr>
<tr>
<td>016, varnished window</td>
<td></td>
</tr>
<tr>
<td>Office 017, white walls</td>
<td></td>
</tr>
<tr>
<td>017, blue wood window</td>
<td></td>
</tr>
<tr>
<td>Lecture Room 018, white plaster walls</td>
<td></td>
</tr>
<tr>
<td>018, blue wood windows</td>
<td></td>
</tr>
<tr>
<td>Corridor C000F, white plaster walls</td>
<td></td>
</tr>
<tr>
<td>Office 018C, white plaster</td>
<td>walls</td>
</tr>
<tr>
<td>018C, blue door</td>
<td></td>
</tr>
<tr>
<td>Office 018B, white plaster</td>
<td>walls</td>
</tr>
<tr>
<td>018B, blue door</td>
<td></td>
</tr>
<tr>
<td>Office 018A, white plaster</td>
<td>walls</td>
</tr>
<tr>
<td>018A, blue door</td>
<td></td>
</tr>
<tr>
<td>Mechanical Room 021, aqua</td>
<td>plaster walls</td>
</tr>
<tr>
<td>Corridor C000E, white sheet</td>
<td>rock walls</td>
</tr>
<tr>
<td>Office 023, white sheet rock</td>
<td>walls</td>
</tr>
<tr>
<td>Location</td>
<td>Lead levels (µg/m³)</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Office 024, white sheet rock walls</td>
<td>0.01, 0.03, 0.26, 0.01, 0.44, 0.01</td>
</tr>
<tr>
<td>024, blue door</td>
<td>0.01</td>
</tr>
<tr>
<td>Office 025, white sheet rock walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>025, blue doors</td>
<td>0.03, 0.02</td>
</tr>
<tr>
<td>Stairs C100C, brown metal hand rail</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Corridors C100S, C100W, yellow walls</td>
<td>0.01, 0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>(plaster and sheet rock)</td>
<td></td>
</tr>
<tr>
<td>Lab 102, yellow paneling on walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>102, brown wood window</td>
<td>0.05, 0.04</td>
</tr>
<tr>
<td>Lab 109, light green plaster walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Office 111, white plaster and sheet rock walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>111, blue metal window</td>
<td>0.04, 0.04</td>
</tr>
<tr>
<td>111, blue wood window sill</td>
<td>0.03, 0.04</td>
</tr>
<tr>
<td>Office 112, white plaster walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>112, blue wood window sill</td>
<td>0.02</td>
</tr>
<tr>
<td>112, brown wood door</td>
<td>0.03, 0.01</td>
</tr>
<tr>
<td>Office 113, white plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Dressing Room 114, pink plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>114, blue wood door</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Dressing Room 115, pink plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Corridor C100N, entry door, brown metal</td>
<td>0.01, 0.03</td>
</tr>
<tr>
<td>Corridor C100C, yellow plaster walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>C100C, orange sheet rock partition wall</td>
<td>0.02, 0.01</td>
</tr>
<tr>
<td>C100C, behind drinking fountain, red wall</td>
<td>0.02, 0.01</td>
</tr>
<tr>
<td>C100N, yellow plaster wall</td>
<td>0.05, 0.05, 0.01, 0.01</td>
</tr>
<tr>
<td>C100N, metal stair stringer, brown</td>
<td>0.09, 0.12</td>
</tr>
<tr>
<td>Classroom 116, light gray plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>116, blue wood windows</td>
<td>0.09, 0.03, 0.02</td>
</tr>
<tr>
<td>116, blue wood doors</td>
<td>0.01, 0.01, 0.02</td>
</tr>
<tr>
<td>Location</td>
<td>Lead Levels (mg/kg)</td>
</tr>
<tr>
<td>---------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Men’s Room 105, white walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>105, white sheet rock ceiling</td>
<td>0.03, 0.01</td>
</tr>
<tr>
<td>105, gray stall panels</td>
<td>0.02, 0.05</td>
</tr>
<tr>
<td>Women’s Room 106, blue door, interior</td>
<td>0.02, 0.02</td>
</tr>
<tr>
<td>Lobby L100, yellow plaster walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Theater 120, brown metal doors</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>120, small walls at entry doors, red</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>120, black wood floor</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>120, stage, black wood floor</td>
<td>0.04, 0.16, 0.06</td>
</tr>
<tr>
<td>120, black wood seating risers</td>
<td>0.04, 0.01, 0.01</td>
</tr>
<tr>
<td>120, ladder up to mezzanine, dark blue metal</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>120, behind black curtains, light gray walls, north side</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>120, behind black curtains, light gray walls, south side</td>
<td>0.10, 0.01, 0.01</td>
</tr>
<tr>
<td>120, SE corner, black metal door</td>
<td>0.01, 0.02</td>
</tr>
<tr>
<td>120 back wall, dark blue sheet rock wall</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>Storage Room 122, light blue plaster walls</td>
<td>0.05, 0.03, 0.02</td>
</tr>
<tr>
<td>122, white wood window</td>
<td>0.01, 0.03</td>
</tr>
<tr>
<td>Equipment Storage 121, white plaster walls</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>121, black metal duct on ceiling</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td>121, white metal window</td>
<td>0.01, 0.01</td>
</tr>
<tr>
<td><strong>EXTERIOR, SOUTH SIDE, white wood trim around door</strong></td>
<td><strong>3.16, 3.11</strong></td>
</tr>
<tr>
<td>Brown wood trim around door</td>
<td><strong>2.28, 3.49, 2.45</strong></td>
</tr>
<tr>
<td>Brown wood door</td>
<td>0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Red-brown wood trim around door</td>
<td><strong>3.36, 4.32, 2.57</strong></td>
</tr>
<tr>
<td>Brown wood windows from offices on south hallway</td>
<td>0.01, 0.01, 0.02, 0.01, 0.01</td>
</tr>
<tr>
<td>Description</td>
<td>Coordinates</td>
</tr>
<tr>
<td>-------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Brown wood handrail along balcony</td>
<td>0.04, 0.02, 0.01, 0.01</td>
</tr>
<tr>
<td>Brown metal windows from mechanical room 021</td>
<td><strong>3.85, 3.47</strong></td>
</tr>
<tr>
<td>EAST SIDE, brown metal window from Mechanical Room 021</td>
<td><strong>3.89</strong></td>
</tr>
<tr>
<td>Brown metal window, NE corner of east elevation</td>
<td><strong>3.36, 2.59</strong></td>
</tr>
<tr>
<td>Brown metal downspout</td>
<td>0.01, 0.02, 0.01</td>
</tr>
<tr>
<td>NORTH SIDE, black metal handrail</td>
<td>0.04, 0.02, 0.01</td>
</tr>
<tr>
<td>Brown metal doors</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>Brown wood door trim (east door)</td>
<td><strong>2.67, 2.61</strong></td>
</tr>
<tr>
<td>Brown metal door trim (west door)</td>
<td>0.01, 0.02, 0.01</td>
</tr>
<tr>
<td>Brown wood window which faces east (Corridor C100E)</td>
<td>0.01, 0.05, 0.01, 0.02</td>
</tr>
<tr>
<td>Brown wood windows which face north</td>
<td><strong>3.53, 3.91, 3.62, 4.79</strong></td>
</tr>
<tr>
<td>(Classroom 116 and basement Offices 014, 015, 016)</td>
<td></td>
</tr>
<tr>
<td>Brown wood window in west half of building, north exposure</td>
<td>0.04, 0.02, 0.01, 0.01</td>
</tr>
<tr>
<td>Brown metal window in west half of building, north exposure</td>
<td><strong>0.47, 1.52, 1.90</strong></td>
</tr>
<tr>
<td>Brown metal door</td>
<td>0.01, 0.04, 0.01, 0.05</td>
</tr>
<tr>
<td>WEST SIDE, brown metal windows</td>
<td><strong>2.79, 3.61, 1.95</strong></td>
</tr>
<tr>
<td>old brown metal downspout</td>
<td><strong>1.38, 0.04, 0.41</strong></td>
</tr>
<tr>
<td>Brown metal door</td>
<td>0.06, 0.03, 0.01</td>
</tr>
<tr>
<td>White plaster ceiling, above stairwell to 2nd floor storage</td>
<td>0.47, 0.35, 0.38, 0.15</td>
</tr>
<tr>
<td>Entry door to 205, tan wood</td>
<td>0.04, 0.03</td>
</tr>
<tr>
<td>Brown metal staircase up to 2nd floor</td>
<td>0.02, 0.03, 0.19</td>
</tr>
<tr>
<td>Brown wood handrail up to 2nd floor</td>
<td>0.04, 0.02</td>
</tr>
<tr>
<td>205, tan plaster walls</td>
<td>0.02, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>205, brown wood trim</td>
<td>0.05, 0.03, 0.02, 0.11</td>
</tr>
<tr>
<td>Location</td>
<td>Lead Levels</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>211, blue fiber walls</td>
<td>0.05, 0.02, 0.06, 0.06</td>
</tr>
<tr>
<td>211, white wood windows</td>
<td>0.04, 0.07</td>
</tr>
<tr>
<td>211, 211, white fiber ceiling</td>
<td>0.06, 0.06</td>
</tr>
<tr>
<td>208, tan plaster walls</td>
<td>0.04, 0.02, 0.02, 0.01</td>
</tr>
<tr>
<td>207, yellow plaster walls</td>
<td>0.01, 0.01, 0.01, 0.01</td>
</tr>
<tr>
<td>207, yellow wood trim</td>
<td>0.07, 0.17, 0.09</td>
</tr>
<tr>
<td>208, tan wood trim</td>
<td>0.01, 0.03, 0.07, 0.08</td>
</tr>
<tr>
<td>208A, green wood door to closet</td>
<td>0.05, 0.04</td>
</tr>
<tr>
<td>EXTERIOR, 208 window, brown metal</td>
<td><strong>1.85, 2.01</strong></td>
</tr>
<tr>
<td>EXTERIOR, brown wood siding</td>
<td><strong>4.09, 1.63, 3.32, 3.06, 2.28</strong></td>
</tr>
<tr>
<td>EXTERIOR, Brown fascia board on theater roof</td>
<td><strong>3.57, 3.69, 0.45</strong></td>
</tr>
<tr>
<td>EXTERIOR, brown metal window in tower structure</td>
<td><strong>1.27, 1.75</strong></td>
</tr>
</tbody>
</table>

**LEAD SUMMARY:** Interior paint is not lead-based. Some of the readings of interior surfaces do show the presence of lead, but below the HUD standard. A significant percentage of the exterior paint is lead-based.
MU EHS has completed a survey of Fine Arts Annex (Building #C37-155). The survey was made to identify asbestos-containing material (ACM) which will be disturbed by the demolition of the building. As a result of the survey, ACM was identified within the scope of the project.

The inspection was conducted to satisfy the requirements of 40CFR 61, subpart M, which stipulates that all buildings be “thoroughly inspected” for asbestos before the commencement of renovation or demolition activities. The asbestos inspection was conducted by Pete Kohler (Missouri Asbestos Inspector #10883, expires 1/13/17). The survey was conducted in October and November, 2016, and the report was completed on December 5, 2016.

As part of this inspection, I made observations of each room within the scope of work. Consistent with applicable standards for asbestos inspections, I collected representative samples of suspect materials sufficient to make a reliable determination of the presence of asbestos. I identified sample locations using a numbered piece of duct tape, where possible.

The samples were analyzed using Transmission Electron Microscopy (TEM) on floor tile, and polarized light microscopy (PLM) on all others, with an extra step in preparation of samples which contain hard-to-analyze, non-organically bound material (PLM NOB), such as adhesive flooring mastic, or tarpaper.

Pipes and ducts insulated with black neoprene or fiberglass were inspected but not necessarily sampled.
I identified a number of suspect materials within the scope of work, including: pipe insulation, ductwork insulation, floor tile, cove base, adhesive mastic, floor leveler, flooring underlayment, acoustic ceiling tile, ceiling and wall plaster, sheet rock joint compound, window caulk, window glazing compound, roofing materials, fire doors.

As a result of analysis of samples, the following materials were found to contain asbestos in levels greater than 1%:

- floor tile and adhesive mastic
- window glazing compound
- fire doors presumed to have ACM cores
- built-up roofing felt/asphalt
- aluminized layer on built-up roofing
- waterproofing patch on foundation, south side, by balcony

FIELD OBSERVATIONS

Fine Arts Annex is a three story brick and wood structure. It was built in 1945, and acquired by the University of Missouri in 1987.

Fine Arts Annex is not on the steam loop from University Power Plant. It has its own boiler in Mechanical Room 11, which supplies steam radiators in part of the building, radiant heating in part of the building, and steam to an air handler in Mechanical Room 21.

The building is composed of two distinct halves, with the west half typically cooled by window air conditioners and heated by steam radiators; and the east half typically cooled by two central air units, heated with radiant fin/tube heating, and forced air heating through ductwork that originates in Room 21.

One large classroom in the east half, Room 116, has steam radiator heat.

The frame of the building is wood, with some exterior cinder block walls, covered by blond brick. The second floor is wood frame with wood siding. Subfloors are typically wood, except in the basement, which is concrete. There are two stairwells between the basement and the 1st floor, and one flight of stairs to the attic. The building has no elevator.
A theater is located in the 1st floor of the east half of the building, with theater seating on a wood frame, and a wood stage. There are two large classrooms in the east half of the building. The building also contains faculty offices, dressing rooms for the theater, storage rooms, rest rooms, a photographic dark room, a print shop, and mechanical rooms.

Walls are plaster or sheet rock. Ceilings are generally plaster, some of which is textured, or drop-in acoustic tiles in a suspended metal grid. Plaster and sheet rock joint compound were sampled throughout the building, and found not to contain asbestos.

Ceilings in the west side of the basement are generally exposed plaster. Ceilings in the east side of the basement are generally drop ceilings. The ceiling tiles were sampled and do not contain asbestos.

Ceilings in the west side of the 1st floor are generally drop ceilings, and the tiles do not contain asbestos. The ceiling in Theater 120 and Classroom 018 have thick mineral wool insulation applied to the ceilings, for sound dampening. This material was sampled and analyzed. It does not contain asbestos.

Flooring in the west half of the basement is typically 12” floor tile, laid with black mastic on concrete. Flooring in the east half of the basement is generally roll carpet on concrete. Room 014 has carpet on top of floor tile on concrete. There are several different styles of 12” tile, and samples were collected of each. The 12” yellow floor tile in Corridor C000, which is the lobby space in front of Lecture Room 018, contains asbestos. The mastic from this tile contains <1% chrysotile asbestos. The other 12” floor tile in the basement does not contain asbestos, and the mastic does not contain asbestos.

Flooring in the west half of the 1st floor is generally 12” floor tile with black mastic on wood. Samples were collected of the different colors and styles of tile. The floor tile is negative for asbestos. The mastic from beneath the tile is negative for asbestos, except in Office 101, which has positive mastic under negative tile.

The east half of the 1st floor is comprised of the theater and its lobby and storage rooms, Classroom 116, and a corridor. The theater has a wood floor with black coating, somewhat heavier than paint. The coating was sampled and analyzed. It does not contain asbestos. Classroom 116 has rolled carpeting on concrete. The corridor C100E
has 12” white floor tile with black mastic. The tile is negative for asbestos. The mastic is positive for asbestos.

Men’s rest room, Room 105, has sheet vinyl flooring. The sheet vinyl does not contain asbestos. Women’s rest room, Room 106, has 12” yellow floor tile, put down with blond mastic. The blond mastic is not suspect material and was not analyzed. The yellow floor tile does not contain asbestos.

In several locations, floor leveler was identified beneath the floor tile. Samples of leveler were analyzed as negative for asbestos. It is possible that other leveler may be uncovered in the course of the project. It would then be necessary for EHS to collect additional samples for analysis.

Flooring in the storage space in the attic is wood, or carpet on wood. The exception to this is Room 211, which has a tarpaper underlayment under old roll carpeting. The tarpaper does not contain asbestos.

Cove base is negative throughout the building. Most of the cove base is clearly vinyl, and is not suspect material. In one spot, the cove base seemed older, stiffer, and not rubbery, so I collected a sample. It does not contain asbestos, and the mastic from the cove base does not contain asbestos.

Windows throughout the building are generally metal frame casements, with single strength glass and window glazing compound. The window glazing compound and caulk around the perimeter of the units were sampled. The window glazing was found to contain less than 1% chrysotile asbestos at several of the locations I sampled. I returned to the windows with inconclusive results and took more samples. These samples I had analyzed by TEM, which is the most rigorous analytical method. The analysis came back as POSITIVE FOR ASBESTOS. The window glazing compound contains asbestos. The caulk, around the perimeter of the windows was found to contain <1% chrysotile at one location. I collected another sample of this window caulk and had it analyzed by TEM. It was found negative for asbestos.

The windows can be removed intact, and disposed of as ACM. This will address the window glazing compound. The caulk, being negative, is inconsequential.

Inside the front entry, there is a half flight of stairs up to the level of the theater lobby. This leaves open space beneath the rest rooms of the 1st floor. The space is relatively open. Pipe insulation is fiberglass. Drain pipes from the toilets are new PVC.
With the assistance of Campus Facilities, an access panel was cut into the wall shared by the men’s room and the women’s room, to inspect pipe insulation. The plumbing lines are insulated with fiberglass. The drains are bare PVC. No suspect insulation was identified.

Pipe insulation in Mechanical Room 021 is fiberglass and black neoprene. It is not suspect material. These pipes continue over the drop ceiling of the basement. Ductwork is insulated with fiberglass. This ductwork carries heating and cooling to most of the east half of the building. Some areas in the east part of the building have forced air through ductwork, plus radiant heat from fin/tube heaters along the floor. No suspect pipe insulation was identified in the mechanical room, or coming from the mechanical room.

Pipes in Mechanical Room 011 are generally un-insulated. Behind Room 011, in Lab 007, the piping that supplies most of the west half of the building is fixed to the ceiling. It is insulated with fiberglass. Lines running over the hallway ceiling to the rest rooms are fiberglass.

Exposed steam pipes that supply the radiators in the rest of the basement and 1st floor in the west half of the building are typically bare.
The mezzanine level of the theater has wood flooring. No suspect pipe insulation is present. An access panel in the ceiling goes above the theater.

The ceiling of the Theater, Room 120, is curved like a Quonset hut. There is space above the ceiling, and ductwork to diffusers in the ceiling is fiberglass flex-duct, with a large fiberglass main down the middle.

Loose insulation blown into the attic space is negative for asbestos. An access panel in the ceiling of Corridor C100E shows the same material; none of the insulation is suspect.

The black curtains around the perimeter walls of the theater were sampled and analyzed. The curtain material does not contain asbestos.

Lecture Room 018 has large acoustic panels on the walls. The material in the panels does not contain asbestos. This room has a fireplace, with refractory brick. A sample of the firebrick was found negative for asbestos. The ceiling is negative for asbestos.

Dark Room 002 has black coating on a concrete floor. The coating does not contain asbestos. Plumbing for the darkroom sinks is un-insulated, or insulated with fiberglass where it travels along the ceiling. Darkroom fans penetrate the exterior wall, and I found no suspect material involved.
In Lab 007, there is an access panel in the plaster ceiling, but the space that it opens to is only one floor joist wide, and it contains no suspect material. Loose debris from this space was analyzed. No asbestos was found.

Fire suppression piping is bare throughout the building.

An access panel in the ceiling of the entry opens into the tower, which is unused. Above the access panel, the tower is open and bare. No suspect material was identified.

The doors in this building are almost all fire-rated. Fire doors are presumed to have asbestos-containing cores. If the doors are to be discarded, it must be done by asbestos-trained workers, and they must be handled as ACM. If the hardware all stays in place, the may be re-purposed.

There are numerous roofs on this building; of two different varieties. The flat roofs have EPDM on top of ½” fiberboard, on top of built-up roofing which is made of alternating felt and asphalt layers, on a plywood deck. The slope roofs are shingles on tarpaper on a 1x wood deck. Samples of both types of roof were collected and analyzed. Each component was analyzed separately.

The felts of the built-up roofing on one of the flat roofs contains asbestos. The roof which is positive for asbestos is above the back corridor, C100N, which is a flat roof between Classroom 016 and Theater 120.

On other built-up roofing samples, one layer of aluminized roll roofing was found to contain <1% chrysotile asbestos. This silver coating, on the top layer of the built-up felts/asphalt roof, is often found to be positive material. It is prudent to presume this silver layer of the built-up roof to be ACM, and dispose of it accordingly. The positive silver layer was found on the roof over the back corridor, C100N; and over the front southwest corner of the structure.

No other roofing material was found to contain asbestos.

The EPDM membrane on the floor of the balcony across the front of the structure is stretched across concrete. A caulked patch on the EPDM does not contain asbestos.
A waterproofing patch on the outside of the concrete foundation, near the southeast corner of the balcony, was sampled and analyzed. This material contains asbestos.

**ASBESTOS SUMMARY:**

The flooring system of Corridor C000 contains asbestos; 288 square feet.
The flooring system of the landing of Stair S000N contains asbestos; 40 square feet.
The flooring system of Office 101 contains asbestos; 235 square feet.
The flooring system of Corridor C100E contains asbestos; 120 square feet.

Floor plans showing the areas of positive flooring systems are included.

Window glazing compound contains asbestos. There are several different styles and sizes of windows in the building. Categorized by approximate size, they are:

- 20x40 single casement 15 windows
- 36x48 double hung 6
- 60x72 double casement 4
- 36x60 large double casement 13
- 32x34 basement offices south 9
- 48x84 Room 116 large 5
- 48x48 basement offices north 4

Fire doors are presumed to contain asbestos cores. There are 55 fire doors.

The built-up roofing felts over Corridor C100N contains asbestos. This is an area of 172 square feet. This roof also has aluminized coating on the top layer of felts.
The silver aluminized roofing layer on built-up felts, over the southwest corner of the building contains asbestos. This is an area of 883 square feet.

A waterproofing patch of rubberized material on the exterior of the foundation, by the southeast corner of the balcony contains asbestos. This is a patch of 2 square feet.
UNIVERSAL WASTE

In addition to the asbestos-containing material listed above, the following items need to be removed from Fine Arts Annex before demolition:

- 12 window air conditioning units
- 2 external central air conditioning units
- 93 fluorescent light fixtures, with their bulbs
- 4 large exterior lights, mounted on the walls of the building
- 17 EXIT signs
- 58 hydraulic door closers
- 2 drinking fountains
- 5 smoke detectors
- 4 thermostats
- 14 emergency fire lights
<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Room or Location</th>
<th>Sample Description</th>
<th>Asbestos Present</th>
<th>ACM Description</th>
<th>Other Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>161026-01</td>
<td>Fine Arts Annex, Corridor C000W</td>
<td>12&quot; blue floor tile</td>
<td>No</td>
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<td>100% matrix material</td>
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<tr>
<td>161026-02</td>
<td>C000W</td>
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<td>161026-03</td>
<td>C000W</td>
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<td>10% quartz, 90% non-fibrous</td>
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<td>161026-04</td>
<td>Room 007</td>
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<td>161026-05</td>
<td>Men’s Room 004</td>
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<td>161026-06</td>
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<td>161026-07</td>
<td>Room 002</td>
<td>Gray floor leveler</td>
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<td>161026-08</td>
<td>Room 002</td>
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<td>161026-09</td>
<td>Stairway S000S</td>
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<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
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<td>ACM Description</td>
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<td>161026-10</td>
<td>Corridor C000</td>
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<td>96.5% matrix material</td>
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<td>161026-11</td>
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<td>100% matrix material</td>
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<tr>
<td>161026-12</td>
<td>C000</td>
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<td>161026-13</td>
<td>Corridor C000E, by Room 21</td>
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<td>161026-14</td>
<td>Corridor C000F, by Room 18</td>
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<td>161026-15</td>
<td>Room 018 fireplace</td>
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<td>20% quartz, 80% non-fibrous</td>
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<td>161026-16</td>
<td>Room 018</td>
<td>Refractory brick</td>
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<td>161026-17</td>
<td>Room 018</td>
<td>Soundproofing panel</td>
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<td>161026-18</td>
<td>Stairway S000N, landing</td>
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<tr>
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<td>5x18 dark brown floor tile</td>
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<td>100% matrix material</td>
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<tr>
<td>161026-21</td>
<td>Stairway S000N, landing</td>
<td>9&quot; light brown floor tile</td>
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<td>81.6% matrix material</td>
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<tr>
<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
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<td>ACM Description</td>
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<tr>
<td>161026-21</td>
<td>S000N landing</td>
<td>Black mastic from tile above</td>
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<tr>
<td>161027-01</td>
<td>Corridor C100S</td>
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<td>100% matrix material</td>
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<tr>
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<td>Black mastic from tile above</td>
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<td>100% matrix material</td>
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<td>161027-03</td>
<td>C100S</td>
<td>Gray floor leveler</td>
<td>No</td>
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<td>20% quartz, 80% non-fibrous</td>
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<tr>
<td>161027-04</td>
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<tr>
<td>161027-05</td>
<td>C100S</td>
<td>Sheet rock joint compound</td>
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<tr>
<td>161027-06</td>
<td>Room 101, by entry door</td>
<td>12&quot; tan floor tile</td>
<td>No</td>
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<tr>
<td>161027-07</td>
<td>Room 101</td>
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<td>YES</td>
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<td>97.8% matrix material</td>
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<tr>
<td>161027-08</td>
<td>Room 110</td>
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<td>NO</td>
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<td>161027-09</td>
<td>Room 110</td>
<td>Blond mastic from tile above</td>
<td>No</td>
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<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
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<td>ACM Description</td>
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<tr>
<td>161027–10</td>
<td>Room 115</td>
<td>Sheet rock joint compound</td>
<td>No</td>
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<tr>
<td>161027–11</td>
<td>Room 111</td>
<td>12” white floor tile</td>
<td>No</td>
<td></td>
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<tr>
<td>161027–12</td>
<td>Room 111</td>
<td>Black mastic from tile above</td>
<td>No</td>
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<tr>
<td>161027–13</td>
<td>C100E</td>
<td>Rubber stair riser</td>
<td>No</td>
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<tr>
<td>161027–14</td>
<td>C100E</td>
<td>Black mastic from riser above</td>
<td>No</td>
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<tr>
<td>161027–15</td>
<td>Men’s room 105</td>
<td>Sheet vinyl flooring</td>
<td>No</td>
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<td>30% cellulose, 5% glass, 65%</td>
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<tr>
<td>161027–15A</td>
<td>(mastic)</td>
<td>Blond mastic from sheet vinyl flooring</td>
<td>No</td>
<td></td>
<td>100% non–fibrous</td>
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<tr>
<td>161027–16</td>
<td>Room 116</td>
<td>Wall plaster</td>
<td>No</td>
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<td>&lt;1% cellulose, 20% quartz, 80%</td>
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<tr>
<td>161027–17</td>
<td>Room 116</td>
<td>Black mastic on carpet pad</td>
<td>No</td>
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<tr>
<td>161027–18</td>
<td>Room 116</td>
<td>Blue cove base</td>
<td>No</td>
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<tr>
<td>161027–18A</td>
<td>(cove base)</td>
<td>Mastic from cove base</td>
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<tr>
<td>161027–18A</td>
<td>(mastic)</td>
<td>Mastic from cove base</td>
<td>No</td>
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<tr>
<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
<td>Asbestos Present</td>
<td>ACM Description</td>
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<tr>
<td>161027-19</td>
<td>Corridor C100E, by Room 122</td>
<td>12&quot; white floor tile</td>
<td>No</td>
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<tr>
<td>161027-20</td>
<td>C100E</td>
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<td>1.9% CHRYSOTILE</td>
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<td>161027-21 (sheet vinyl)</td>
<td>Janitor's closet 108</td>
<td>Sheet vinyl on panel</td>
<td>No</td>
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<td>35% cellulose, 5% glass, 60% non–fibrous</td>
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<tr>
<td>161027-21A (mastic)</td>
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<td>Mastic from sheet vinyl</td>
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<tr>
<td>161101-01</td>
<td>Exterior, north side, outside Office 113</td>
<td>Window caulk</td>
<td>No</td>
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<tr>
<td>161101-02 (see samples 161114-01 - 161121-06)</td>
<td>Exterior, north side, outside Office 115</td>
<td>Window glazing compound</td>
<td>No</td>
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<td>100% non–fibrous</td>
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<td>161101-03 (See samples 161114-01 - 161121-06)</td>
<td>Exterior, west side, outside Room 004</td>
<td>Window glazing compound</td>
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<td>Exterior, west side, outside Room 004</td>
<td>Window caulk</td>
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<td>161101-05</td>
<td>Exterior, south side, outside Room 025</td>
<td>Window glazing compound</td>
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<td>Room or Location</td>
<td>Sample Description</td>
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<td>ACM Description</td>
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<td>Exterior, south side, balcony</td>
<td>Water-proofing patch</td>
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<td>15% glass, 83% non-fibrous</td>
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<td>Exterior, south side, balcony</td>
<td>Patch on EPDM</td>
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<td>Exterior, north side, outside Room 016</td>
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<td>161101-10</td>
<td>Lobby L100 (texture)</td>
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<td>161101-10A</td>
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<td>&lt;1% cellulose, 20% perlite, 80% non-fibrous</td>
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<td>Outside women’s rest room 106 (texture)</td>
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<td>Drywall plus finish coat–inseparable</td>
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<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
<td>Asbestos Present</td>
<td>ACM Description</td>
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<td>Corridor C000N</td>
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<td>161101-14</td>
<td>Room 016</td>
<td>2x2 drop ceiling tile, recessed,</td>
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<td>gray body</td>
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<td>161101-15</td>
<td>Hallway outside Room</td>
<td>2x2 drop ceiling tile, gray body</td>
<td>No</td>
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<td>161101-16</td>
<td>Corridor C000F</td>
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<td>Room 007, ceiling</td>
<td>Plaster debris</td>
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<td>161101-18</td>
<td>Room 018</td>
<td>Soundproof ceiling spray-on</td>
<td>No</td>
<td>99% cellulose, 1% non-fibrous</td>
<td></td>
</tr>
<tr>
<td>161101-19</td>
<td>Corridor outside</td>
<td>2x2 drop ceiling tile, gray body</td>
<td>No</td>
<td>40% cellulose, 40% mineral wool, 15% perlite, 5% non-fibrous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>dressing room 115</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161102-01</td>
<td>Theater Room 120</td>
<td>Soundproof ceiling spray-on</td>
<td>No</td>
<td>100% non-fibrous</td>
<td></td>
</tr>
<tr>
<td>161102-02</td>
<td>Theater Room 120</td>
<td>Soundproof ceiling spray-on</td>
<td>No</td>
<td>100% non-fibrous</td>
<td></td>
</tr>
<tr>
<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
<td>Asbestos Present</td>
<td>ACM Description</td>
<td>Other Materials</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------</td>
<td>-------------------------------------</td>
<td>------------------</td>
<td>-----------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>161102-03</td>
<td>Theater Room 120</td>
<td>Black coating on wood floor</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161102-04</td>
<td>Theater Room 120</td>
<td>Black coating on wood floor</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161102-05</td>
<td>Theater Room 120</td>
<td>Black curtain material</td>
<td>No</td>
<td></td>
<td>98% cellulose, 2% non–fibrous</td>
</tr>
<tr>
<td>161102-06</td>
<td>Theater Room 120</td>
<td>Black curtain material</td>
<td>No</td>
<td></td>
<td>98% cellulose, 2% non–fibrous</td>
</tr>
<tr>
<td>161102-07</td>
<td>Theater Room 120, north wall</td>
<td>Sheet rock joint compound</td>
<td>No</td>
<td></td>
<td>100% non–fibrous</td>
</tr>
<tr>
<td>161102-08</td>
<td>Theater Room 120, South wall</td>
<td>Sheet rock joint compound</td>
<td>No</td>
<td></td>
<td>100% non–fibrous</td>
</tr>
<tr>
<td>161104-01</td>
<td>Attic space above Theater 120</td>
<td>Loose, blown–in insulation</td>
<td>No</td>
<td></td>
<td>99% glass fibers, 1% other</td>
</tr>
<tr>
<td>161107-01</td>
<td>Attic Room 211, beneath carpet</td>
<td>Black tarpaper</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161107-02</td>
<td>Attic Room 211</td>
<td>Ceiling panel</td>
<td>No</td>
<td></td>
<td>98% cellulose, 2% non–fibrous</td>
</tr>
<tr>
<td>161107-03</td>
<td>Attic Room 208</td>
<td>Wallpaper backing</td>
<td>No</td>
<td></td>
<td>100% non–fibrous</td>
</tr>
<tr>
<td>161107-04</td>
<td>Attic Room 208</td>
<td>South window, exterior caulk</td>
<td>No</td>
<td>&lt;1% chrysotile</td>
<td>100% non–fibrous</td>
</tr>
</tbody>
</table>

<p>| 161107-04 (see samples 161114-01 – 161121-06) | Attic Room 208 | South window, exterior caulk | No | &lt;1% chrysotile | 100% non–fibrous |</p>
<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Room or Location</th>
<th>ACM Description</th>
<th>Other Materials</th>
<th>Asbestos Present</th>
<th>Description</th>
<th>1% Chrysotile</th>
<th>99% Matrix Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>161107-05</td>
<td>Attic Room 208</td>
<td>South window, exterior window</td>
<td>100% non-fibrous</td>
<td>No</td>
<td>Wall plaster</td>
<td>&lt;1% Chrysotile</td>
<td>100% non-fibrous</td>
</tr>
<tr>
<td>161107-06</td>
<td>Attic Room 205, by entry door</td>
<td>Wall plaster</td>
<td>20% quartz, 80% non-fibrous</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>100% non-fibrous</td>
</tr>
<tr>
<td>161114-01</td>
<td>Room 115, exterior</td>
<td>Textured plaster ceiling</td>
<td>10% quartz, 90% non-fibrous</td>
<td>Yes</td>
<td>Window glazing compound</td>
<td>1.9% CHRYSOTILE</td>
<td>98.1% matrix material</td>
</tr>
<tr>
<td>161114-02</td>
<td>Room 112, exterior</td>
<td>Window glazing compound</td>
<td>100% non-fibrous</td>
<td>Yes</td>
<td>Window glazing compound</td>
<td>3.2% CHRYSOTILE</td>
<td>96.8% matrix material</td>
</tr>
<tr>
<td>161119-01</td>
<td>Room 004, exterior</td>
<td>Window glazing compound</td>
<td>100% non-fibrous</td>
<td>Yes</td>
<td>12&quot; blue floor tile</td>
<td>2.6% CHRYSOTILE</td>
<td>97.4% matrix material</td>
</tr>
<tr>
<td>161119-02</td>
<td>Room 115</td>
<td>12&quot; blue floor tile</td>
<td>100% matrix material</td>
<td>No</td>
<td>Black mastic from tile above</td>
<td>No</td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161119-02A</td>
<td>Room 106</td>
<td>12&quot; yellow floor tile (blond mastic, no analysis)</td>
<td>100% matrix material</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>100% matrix material</td>
</tr>
<tr>
<td>Sample Number</td>
<td>Room or Location</td>
<td>Sample Description</td>
<td>ACM Description</td>
<td>Asbestos Present</td>
<td>Other Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------</td>
<td>-----------------</td>
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<td>-----------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>161121-02</td>
<td>Room 120</td>
<td>Spray-on ceiling</td>
<td>No</td>
<td>95% cellulose, 5% other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161121-03</td>
<td>Room 018</td>
<td>Spray-on ceiling</td>
<td>No</td>
<td>95% cellulose, 5% other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161121-04</td>
<td>Room 018</td>
<td>Spray-on ceiling</td>
<td>No</td>
<td>95% cellulose, 5% other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161121-05</td>
<td>Room 208, exterior</td>
<td>Window glazing compound</td>
<td>YES</td>
<td>1.9% CHRYSOTILE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161121-06</td>
<td>Room 208, exterior</td>
<td>Window caulk</td>
<td>No</td>
<td>95% cellulose, 5% non-fibrous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-01</td>
<td>Fine Arts Annex Roof, above Room 116</td>
<td>Roof Core, Flat Roof, ½&quot; fiber board</td>
<td>No</td>
<td>100% matrix material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-01A</td>
<td>Fine Arts Annex Roof, above Corridor C100NW</td>
<td>Roof Core, Flat Roof, ½&quot; fiber board</td>
<td>No</td>
<td>100% matrix material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-02</td>
<td>Roof Core, built-up roofing</td>
<td>Felts/asphalt</td>
<td>No</td>
<td>95% cellulose, 5% non-fibrous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-02A</td>
<td>Roof Core, built-up roofing</td>
<td>Felts/asphalt</td>
<td>&lt;1% chrysotile</td>
<td>100% non-fibrous</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-02B</td>
<td>Roof Core, asphalt shingle</td>
<td>9.2% CHRYSOTILE</td>
<td>90.8% matrix material</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>161115-03</td>
<td>Fine Arts Annex Roof, Above Theater 120</td>
<td>Roof Core, Flat Roof, asphalt shingle</td>
<td>YES</td>
<td>No</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Asbestos Present** indicates whether asbestos was detected in the sample.

**Other Materials** include the materials present in the sample, categorized by their composition.
<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Room or Location</th>
<th>Sample Description</th>
<th>Asbestos Present</th>
<th>ACM Description</th>
<th>Other Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>161115-03A</td>
<td></td>
<td>Roof Core, tarpaper beneath shingles</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161115-04</td>
<td>Fine Arts Annex Roof, Above NW “house”</td>
<td>Roof Core, asphalt shingle</td>
<td>No</td>
<td></td>
<td>11.2% glass, 88.8% matrix material</td>
</tr>
<tr>
<td>161115-04A</td>
<td></td>
<td>Roof Core, tarpaper beneath shingles</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161115-05</td>
<td>Fine Arts Annex Roof, Flat roof on SW corner</td>
<td>Roof Core, flat roof, ½” fiber board</td>
<td>No</td>
<td></td>
<td>98% cellulose, 2% non-fibrous</td>
</tr>
<tr>
<td>161115-05A</td>
<td></td>
<td>Roof Core, aluminum coating on built-up roofing</td>
<td>&lt;1% chrysotile</td>
<td></td>
<td>100% non-fibrous</td>
</tr>
<tr>
<td>161115-05B</td>
<td></td>
<td>Roof Core, built-up roofing Felts/asphalt</td>
<td>No</td>
<td></td>
<td>100% matrix material</td>
</tr>
</tbody>
</table>
POSITIVE FLOORING SYSTEMS
FINE ARTS ANNEX, BASEMENT

Exterior Air Well
Corridor Coon
Corridor Coon

Office 014
Office 015
Office 016

Lecture Room 018

Conference Room 024
Office 023
Office 025

Storage 1

Unexcavated

Jan 010

Electrical Closet 007A
Mechanical 011

Lab 007
Lab Closet 002A

Women 003
Dark Room 002

Men 004

Stair 000

Corridor Coon

Exterior Stair

Exterior Ramp

Asbestos Survey - 25

Revised: 04/18/12 HCR

Fine Arts Annex

Campus Facilities
Space Planning & Management
(573) 882-4506

Level: Basement
Tour Date: 12/28/16 NTS
Building No: 37155
Sheet: 1 of 3
Gross Sq Ft: 7,001

MU North
TO: Pam Eugster  
Planning, Design, & Construction

FROM: Pete Kohler  
Environmental Health & Safety

As an addendum to the original survey, of 12/05/16, MU EHS has completed a second survey of waterproofing tar and a waterproofing membrane on the foundation of Fine Arts Annex. The survey was made to identify asbestos-containing material (ACM) which will be disturbed by the upcoming renovation.

I had found a fibrous piece of fabric on the south side of the foundation, and analysis found this material to contain asbestos. To clarify the extent of this material, MU P, D, & C had holes dug at several locations around the exterior perimeter of the building. Samples of tar were collected at the locations, below grade. Analysis was made by PLM NOB, which is specifically for hard-to-analyze samples like tar or asphalt.

At three spots, tar had been mopped, or painted, on the exterior concrete. This tar is negative for asbestos. At one other location, near the basement door on the west side, the fibrous material was found, like the material on the south side. This material contains asbestos. This material is located behind a thin, finish coat of concrete.

Black mesh fabric found on the exterior foundation of Fine Arts Annex contains asbestos.
# ASBESTOS SAMPLING TABLE

**FINE ARTS ANNEX FOUNDATION**

**PROJECT CP170621**

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>LOCATION/DESCRIPTION</th>
<th>ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>161212-01</td>
<td>Fine Arts Annex, foundation, northeast corner, TAR from below grade</td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161212-02</td>
<td>East side, TAR form below grade</td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161212-03</td>
<td>West side, TAR from below grade</td>
<td>100% matrix material</td>
</tr>
<tr>
<td>161212-04</td>
<td>West side at basement entry door, waterproofing membrane on concrete foundation</td>
<td><strong>CONTAINS 1.7% CHRYSOTILE ASBESTOS</strong>, 98.3% matrix material</td>
</tr>
</tbody>
</table>

**ASBESTOS SUMMARY:** Black fibrous material on the exterior of the foundation of Fine Arts Annex contains asbestos. The material has been found in two spots, totaling 10 square feet. It is possible this material will turn up in other locations, but it was not present in three other spots where we dug.
SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:
   1. Section 033543 "Bonded Abrasive Polished Concrete Floors".
   2. Section 312000 "Earth Moving" for drainage fill under slabs-on-grade.
   3. Section 321313 "Concrete Paving" for concrete pavement and walks.
   4. Section 321373 "Concrete Paving Joint Sealant".

1.3 DEFINITIONS

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

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

   1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
      a. Contractor's superintendent.
      b. Independent testing agency responsible for concrete design mixtures.
      c. Ready-mix concrete manufacturer.
      d. Concrete Subcontractor.
      e. Special concrete finish Subcontractor.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture.
1. Submit historical compressive strength test data which includes average compressive strength for each mix design with a corresponding standard deviation according to ACI-301.

C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified Professional Engineering detailing fabrication, assembly, and support of formwork.
   1. Shoring and Re-shoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and re-shoring installation and removal.

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

F. Samples: For waterstops and vapor retarder.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:
   1. Cementitious materials.
   2. Admixtures.
   3. Form materials and form-release agents.
   4. Steel reinforcement and accessories.
   5. Waterstops.
   6. Curing compounds.
   7. Floor and slab treatments.
   10. Vapor retarders.
   11. Semirigid joint filler.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
   1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
   1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

G. Field quality-control reports.
1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

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

   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
   2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

E. Mockups: Cast concrete slab-on-grade panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.

   1. Build panel approximately 100 sq. ft. (18.6 sq. m) for slab-on-grade in the location indicated or, if not indicated, as directed by Architect.
   2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

1.9 DELIVERY, STORAGE, AND HANDLING

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

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

1.10 FIELD CONDITIONS

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

   1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
   2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and as follows:
   1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
   2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

   A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
      1. ACI 301 (ACI 301M). "Specifications for Structural Concrete," Sections 1 through 5.

2.2 FORM-FACING MATERIALS

   A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
      1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
         a. Structural 1, B-B or better; mill oiled and edge sealed.

   B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

   C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

   D. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.
      A. Void Forms: EPS ASTM D6817 Type EPS 29 with minimum compressive resistance of 29 psi at 10% deformation and minimum compressive resistance of 10.9 psi at 1% deformation.
      B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.
      C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
      D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

B. Plain-Steel Wire: ASTM A 1064/A 1064M.

C. Deformed-Steel Wire: ASTM A 1064/A 1064M.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.


2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), plain-steel bars, cut true to length with ends square and free of burrs.

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

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

2.5 CONCRETE MATERIALS

A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer’s plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type II, gray.
2. Fly Ash: ASTM C 618, Class F or C.
3. Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

C. Normal-Weight Aggregates: ASTM C 33/C 33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years’ satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
1. Maximum Coarse-Aggregate Size: 3/4 inch (19 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. Lignites shall be limited to .07% by weight of fine aggregate in all exposed concrete.
3. Flint and Chert shall be limited to 1% maximum by weight of coarse aggregate.


E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

G. Water: ASTM C 94/C 94M.

H. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm) or other size as recommended by manufacturer and submitted and approved.
1. Basis of Design: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. – Adcor ES hydrophilic non-bentonite waterstop by GCP Advanced Technologies Construction Products for non-moving concrete construction joints.

2.6 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
1. Refer to 033543 Polished Concrete Finishing

2.7 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

2.8 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
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. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
   b. BASF Construction Chemicals - Building Systems; Confilm.
   c. ChemMasters; SprayFilm.
   d. Conspec by Dayton Superior; Aquafilm.
   e. Dayton Superior Corporation; Sure Film (J-74).
   f. Edoco by Dayton Superior; BurkeFilm.
   g. Euclid Chemical Company (The), an RPM company; Eucobar.
h. Kaufman Products, Inc.; Vapor-Aid.
i. Lambert Corporation; LAMBCO Skin.
j. L&M Construction Chemicals, Inc.; E-CON.
k. Meadows, W. R., Inc.; EVAPRE.
l. Metalcrete Industries; Waterhold.
m. Nox-Crete Products Group; MONOFILM.
n. Sika Corporation; SikaFilm.
o. SpecChem, LLC; Spec Film.
p. Symons by Dayton Superior; Finishing Aid.
q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
r. Unitex; PRO-FILM.
s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.

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

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

D. Water: Potable.

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

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. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.
l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Envioco 100.

B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

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. BASF Construction Chemicals - Building Systems; Kure 1315.
b. ChemMasters; Polyseal WB.
c. Conspec by Dayton Superior; Sealcure 1315 WB.
d. Edoco by Dayton Superior; Cureseal 1315 WB.
e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
g. Lambert Corporation; UV Safe Seal.
h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
j. Metalcrete Industries; Metcure 30.
2. **VOC Content:** Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.9 **RELATED MATERIALS**

A. **Expansion- and Isolation-Joint-Filler Strips:** ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. **Bonding Agent:** ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. **Epoxy Bonding Adhesive:** ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
   
   1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

D. **Reglets:** Fabricate reglets of not less than 0.022-inch (0.55-mm) thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

E. **Dovetail Anchor Slots:** Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 **REPAIR MATERIALS**

A. **Repair Underlayment:** Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

   1. **Cement Binder:** ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. **Primer:** Product of underlayment manufacturer recommended for substrate, conditions, and application.
   3. **Aggregate:** Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.
   4. **Compressive Strength:** Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C 109/C 109M.

B. **Repair Overlayment:** Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to match adjacent floor elevations.

   1. **Cement Binder:** ASTM C 150/C 150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
   2. **Primer:** Product of topping manufacturer recommended for substrate, conditions, and application.
   3. **Aggregate:** Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
   4. **Compressive Strength:** Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.
2.11 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent. Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 20 percent.
2. Combined Fly Ash and Pozzolan: 20 percent.
4. Combined Fly Ash or Pozzolan and Slag Cement: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 20 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.10 percent by weight of cement.

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

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete required to be watertight, and concrete with a w/c ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS


1. Minimum Compressive Strength: 4000 psi (34.5 MPa) at 28 days.
2. Maximum W/C Ratio: 0.48.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

B. Slabs-on-Grade and Housekeeping Pads: Normal-weight concrete.

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.


1. Minimum Compressive Strength: 4000 psi (34.5 MPa) at 28 days.
2. Maximum W/C Ratio: 0.43.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

D. Columns: Normal-weight concrete.
1. Minimum Compressive Strength: 6000 psi (34.5 MPa) at 28 days.
2. Maximum W/C Ratio: 0.43.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).

1. Minimum Compressive Strength: 4000 psi (34.5 MPa) at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4–inch nominal maximum aggregate size.

F. Topping Slabs: Normal-weight concrete.
1. Minimum Compressive Strength: 4000 psi (34.5 MPa) at 28 days.
2. Maximum W/C Ratio: 0.50.
3. Slump Limit: 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

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

2.14 CONCRETE MIXING
A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.
2. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION
A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
2. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces shall apply to exposed stairwell walls.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

   1. Install keyways, reglets, recesses, and the like, for easy removal.
   2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEM INSTALLATION

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

   1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
   2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
   3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.

2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR-RETARDER INSTALLATION

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

3.6 STEEL REINFORCEMENT INSTALLATION

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

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

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

1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.7 JOINTS

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

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

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch (3.2 mm). Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- (3.2-mm-) wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

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

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

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.
3.8 WATERSTOP INSTALLATION

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.9 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

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

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).

   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

   1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301 (ACI 301M).
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

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

3.10 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

   1. Apply to concrete surfaces not exposed to public view.
B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view.

C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix 1 part portland cement to 1-1/2 parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.

3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix 1 part portland cement and 1 part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

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

3.11 FINISHING FLOORS AND SLABS

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

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

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

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E 1155 (ASTM E 1155M), for a randomly trafficked floor surface:

   a. Specified overall values of flatness, F(F) 30; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 15; for all slabs.

3. Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).
D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
   1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
   1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.12 MISCELLANEOUS CONCRETE ITEM INSTALLATION

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

B. Curb: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:
   1. Coordinate sizes and locations of concrete bases with actual equipment provided.
   2. Construct concrete bases 6 inches ((150 mm)) high unless otherwise indicated, and extend base not less than 6 inches (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.
   3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
   4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of concrete base.
   5. Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   6. Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

3.13 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 (ACI 301M) for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer’s written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. **Moisture Curing:** Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. **Moisture-Retaining-Cover Curing:** Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies does not interfere with bonding of floor covering used on Project.

3. **Curing Compound:** Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
   a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

4. **Curing and Sealing Compound:** Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

### 3.14 LIQUID FLOOR TREATMENT APPLICATION

**A.** Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days’ old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

**B.** Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

### 3.15 JOINT FILLING

**A.** Prepare, clean, and install joint filler according to manufacturer's written instructions.
1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches (50 mm) deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.16 CONCRETE SURFACE REPAIRS

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

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

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

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

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

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

2. After concrete has cured at least 14 days, correct high areas by grinding.

3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

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

3.17 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture less than 25 cu. yd. (19 cu. m), plus one set for each additional 100 cu. yd. (38 cu. m) or fraction thereof.

   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below or 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C 31/C 31M.

   a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

CAST-IN-PLACE CONCRETE

3.18 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
SECTION 033543 - POLISHED CONCRETE FINISHING

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. Polished concrete finishing.
      2. Liquid floor treatments.
   B. Related Requirements:
      1. Section 033000 “Cast-in-Place Concrete” for concrete not designated as polished concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, initial finishing, and curing.

1.3 DEFINITIONS

1.4 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site.
      1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with polished concrete to attend, including the following:
         a. Contractor's superintendent.
         b. Independent testing agency responsible for concrete design mixtures.
         c. Ready-mix concrete manufacturer.
         d. Cast-in-place concrete subcontractor.
         e. Polished concrete finishing Subcontractor.
      2. Review cold- and hot-weather concreting procedures, curing procedures, construction joints, concrete repair procedures, concrete finishing, and protection of polished concrete.

1.5 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Polishing Schedule: Submit plan showing polished concrete surfaces and schedule of polishing operations for each area of polished concrete before start of polishing operations. Include locations of all joints, including construction joints.
C. Samples for Verification: For each type of exposed concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.


1. Provide quantity take offs for each interior liquid floor treatment.

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

1. Repair materials.
2. Liquid floor treatments.

D. Minutes of preinstallation conference.

1.7 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials – Flooring Systems: Provide the quantity of each interior liquid floor treatment used.

B. Maintenance Data: For ground and polished concrete to include in maintenance manuals.

1.8 QUALITY ASSURANCE


1. Liquid Floor Treatments: 200 g/L.

B. Field Sample Panels: After approval of verification sample and before casting concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, approximately 48 by 48 inches minimum, to demonstrate the expected range of finish, color, and appearance variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
3. Demolish and remove field sample panels when directed.

1.9 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For walkway surfaces, provide dynamic coefficient of friction of 0.42 minimum per ANSI B101.3.

2.2 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatments for Polished Concrete Finish (CP1):

1. Clear, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and is suitable for polished concrete surfaces.

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

      1) Advanced Floor Products; Retro Plate 99.
      2) L&M Construction Chemicals, Inc.; FGS Hardener Plus.
      3) Prosoco Inc.; Consolideck LS.
      4) L.M. Scofield Company; Formula One.

2. Liquid Densifier: Odorless, non-hazardous, silicate that penetrates concrete to react with free lime and calcium hydroxide to produce permanent chemical reaction that hardens and densifies concrete surface.

3. Polish Guard: Non-film forming, stain resistant, food resistant, chemical stain resistant, impregnating sealant designed to be used on concrete surfaces previously densified.

4. Floor Patching Compound: Compound composed of 40 percent portland cement, 45 percent limestone, and 15 percent vinyl acetate copolymer, when mixed with dust salvaged from grinding process forms a paste that hardens when surface imperfections are filled.

5. Grout Material: Clear modified silicate sealant, containing no pore clogging latex, when mixed with dust salvaged from grinding process forms a paste that reacts with calcium hydroxide in concrete that hardens when surface imperfections are filled.

6. Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.

B. Penetrating Liquid Floor Treatment (CP2):

1. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

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

      1) ChemMasters; Chemsil Plus.
      3) Dayton Superior; Sure Hard Densifier J17.
      4) Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
      5) Kaufman Products, Inc.; SureHard.
      6) L&M Construction Chemicals, Inc.; Seal Hard.
      7) Meadows, W. R., Inc.; LIQUI-HARD.
PART 3 - EXECUTION

3.1 LIQUID FLOOR TREATMENT APPLICATION

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer’s written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.

Some manufacturers state that the penetrating liquid floor treatment also functions as a curing aid. If used as a cure, delete minimum age of concrete in first subparagraph below and revise application method to follow manufacturer’s written instructions. Coordinate with “Concrete Protecting and Curing” Article.

2. Do not apply to concrete that is less than 28 days’ old.

3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.2 POLISHING CONCRETE

A. Examine substrates for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and that substrates are free of cracks, ridges, depressions, scale, lippage, curled joints, spalling, and foreign deposits that might interfere with adhesion of floor tile.

B. Preparation: Prepare slab per manufacturer’s recommendations.

1. Clean dirt, dust, oil, grease and other contaminants from surfaces that interfere with penetration of liquid floor treatments. Rinse thoroughly using pressure water spray to remove cleaner residues. Allow surfaces to dry completely before application of product.

C. Sequence of Polishing: Perform polishing before partition studs are erected and final polishing after gypsum board is installed.

D. Initial Grinding:

1. Allow slab to cure for 28 days prior to grinding.

2. Use grinding equipment with metal bonded grinding pads. Hand grind as needed to achieve finish desired on all surfaces indicated.


4. Make sequential passes with each pass perpendicular to previous pass using finer grit pad with each pass, up to 150 grit.

5. Achieve maximum refinement with each pass before proceeding to finer grit pads.

6. Vacuum floor using squeegee vacuum attachment after each pass.

7. Continue grinding until aggregate exposure matches approved field mock-ups.

E. Treating Surface Imperfections:

1. Mix floor patching compound and grout material with dust created by grinding operations to match color of adjacent concrete surface.

2. Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids.

POLISHED CONCRETE FINISHING
3. Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.

F. Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow to cure according to manufacturer's instructions.

G. Honing:
   1. Use grinding equipment with resin bonded grinding pads. Hand grind as needed to achieve finish desired on all surfaces indicated.
   2. Grind concrete in one direction starting with 50 grit pad and make as many sequential passes required to remove scratches, each pass perpendicular to previous pass, up to 400 grit pad reaching maximum refinement with each pass before proceeding to finer grit pads.
   3. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
   4. Continue honing until gloss appearance, as measured according to ASTM E 430, matches approved field mock-ups.

H. Polishing:
   1. Use polishing equipment with resin bonded polishing and burnishing pads.
   2. Begin polishing in one direction starting with 800 grit pad.
   3. Achieve maximum refinement with each pass before proceeding to finer grit pads.
   4. Auto scrub or vacuum floor using squeegee vacuum attachment after each pass.
   5. Continue polishing until gloss appearance, as measured according to ASTM E 430, matches approved field mock-ups.

I. Polish Guard: Uniformly apply and remove excessive liquid according to manufacturer's instructions.

J. Final Polished Concrete Floor Finish:
   1. Class C - Medium Aggregate Finish: Remove not more than 1/8 inch of concrete surface by grinding and polishing resulting in majority of exposure displaying medium aggregate with no, or small amount of, large aggregate at random locations.
   2. Level 2 - Medium Gloss Appearance:
      a. Procedure: Not less than 5 step process with full refinement of each diamond pad up to 800 grit resin bonded pad with one application of diversifier.
      b. Gloss Reading: Not less than 55 according to ASTM E 430 before polish guard application.

K. Apply polished concrete finish system to cured and prepared slabs to match accepted mockup.

3.3 PROTECTION OF POLISHED CONCRETE

A. Protect polished concrete from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by finish manufacturer.

END OF SECTION 033543
SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

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, architectural precast concrete units.

B. Related Requirements:

1. Section 033000 “Cast-in-Place Concrete” for installing connection anchors in concrete.
2. Section 051200 “Structural Steel Framing” for furnishing and installing connections attached to structural steel framing.
3. Section 055000 “Metal Fabrications” for kickers and other miscellaneous steel shapes.
5. Section 084413 “Glazed Aluminum Curtain Walls” for aluminum framing system set into architectural precast concrete units.

1.3 DEFINITIONS

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

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to precast concrete placement including but not limited to, the following:

1. Meet with Owner, Architect, testing and inspecting agency representative, precast concrete system manufacturer's technical representative and installer, and installer and installers whose work interfaces with or affects precast concrete assemblies.
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, discuss, and coordinate the interrelationship of precast concrete cladding systems with waterproofing systems, roofing systems, aluminum curtainwall systems, and other exterior wall components including provisions for anchorage, closures and trim, flashing and protecting finishes.
4. Review and discuss the sequence of work required to construct a weathertight exterior building envelope.
5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
6. Review field quality control and testing requirements.
1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

C. Shop Drawings:
   1. Detail fabrication and installation of architectural precast concrete units.
   2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
   3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
   4. Indicate formliner orientations and seams.
   5. Indicate details at building corners.
   6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
   7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
   8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
   9. Include plans and elevations showing unit location and sequence of erection for special conditions.
  10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
  11. Indicate relationship of architectural precast concrete units to adjacent materials.
  12. Indicate locations, dimensions, and details, including corner units and special shapes, and joint treatment.
  13. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and Shop Drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.

D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
   1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.

1.6 INFORMATIONAL SUBMITTALS

A. Delegated-Design Submittal: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

B. Qualification Data: For Installer, fabricator and testing agency.

C. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

D. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

E. Low-Emitting Materials - Sealants: Include manufacturer’s printed statement of VOC content in g/l for each interior sealant, and sealant primer.
1. Provide quantity take offs for each sealant, and sealant primer.

F. Welding certificates.

G. Material Certificates: For the following items:
   1. Cementitious materials.
   2. Reinforcing materials and prestressing tendons.
   4. Structural-steel shapes and hollow structural sections.
   5. Insulation.

H. Material Test Reports: For aggregates.

I. Source quality-control test reports.
   1. Submit reports to Owner and Architect within five (5) working days of site visit.

J. Field quality-control and special inspection reports.

K. Minutes of preinstallation conference.

1.7 CLOSEOUT SUBMITTALS:

A. Low-Emitting Materials - Sealants: Provide the quantity of each interior sealant and sealant primer used.

1.8 QUALITY ASSURANCE


B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
   1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units at time of bidding.
   2. Fabricator is located within 500 miles of Project site.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Architectural Sealants: 250 g/L.
   2. Architectural Non-porous Sealant Primers: 250 g/l.
   3. Architectural Porous Sealant Primers: 775 g/l.

E. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

G. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 16 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. See Basis of Design color and finish in Finishes section below.
2. Locate panels where indicated or, if not indicated, as directed by Architect.
3. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
4. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove sample panels when directed.

H. Range Samples: After sample panel approval and before fabricating architectural precast concrete units, produce a minimum of three sets of 3 to 5 samples, approximately 16 sq. ft. in area, representing anticipated range of each color and texture on Project's units. Maintain one set of range samples at Project site and remaining range sample sets at manufacturer's plant as color and texture approval reference.

I. Mockups: After sample panel and range sample approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. All materials and submittals materials that constitute the mockup must be submitted and approved prior to mockup construction.
2. Build free standing integrated mockup of the exterior wall assembly at the location shown on Drawings or if not shown at a location directed by the Architect, incorporating foundation wall assemblies, precast wall assemblies, curtainwall and glazing assemblies, flashings, closures, trim and sealants.
   a. Include typical components, attachments to building structure, and methods of installation.
3. Prepare mockup for inspection and testing requirements: Mockups are to be reviewed and tested in phases or stages of completion. For example: precast cladding installation and joint sealing is to be reviewed prior to installation of curtainwall and glazing assemblies and joint sealants. Coordinate phasing for each mockup type with Architect and Owner.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.9 COORDINATION

A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
B. Support units during shipment on nonstaining shock-absorbing material.
C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
D. Place stored units so identification marks are clearly visible, and units can be inspected.
E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. See Reference Sample/Produce below.

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, qualified to practice in the state of Missouri to design the architectural precast concrete units.

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

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

1. Loads: As indicated on Structural Drawings.
2. Internal Pressure Coefficient = 0.18.
3. Design precast concrete units and connections to maintain clearances at openings, to allow for fabrication and construction tolerances, to accommodate live-load deflection, shrinkage and creep of primary building structure, and other building movements as follows:
   a. Upward and downward movement of 1 inch.
4. Thermal Movements: Provide for in-plane thermal movements resulting from annual ambient temperature changes of 120 deg F.

2.3 MOLD MATERIALS

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

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

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


2.4 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

C. At Panels used for exterior flat work use one of the following:
   1. Epoxy-Coated Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed bars, ASTM A 775/A 775M or ASTM A 934/A 934M epoxy coated.

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

E. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

2.5 PRESTRESSING TENDONS


2.6 CONCRETE MATERIALS

A. Regional Materials: Precast architectural concrete shall be manufactured from aggregates and cement that have been extracted or recovered, as well as manufactured, within 500 miles of Project site.

B. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.
   1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33/C 33M, with coarse aggregates complying with Class SS. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.
   1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.
   2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand compatible with coarse aggregate; to match approved finish sample.

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

E. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.

2.7 STEEL CONNECTION MATERIALS

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

B. Carbon-Steel-Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or Type B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Structural Tubing: ASTM A 500/A 500M, Grade B or Grade C.
D. Deformed Steel Wire or Bar Anchors: ASTM A 496/A496M or ASTM A 706/A 706M.

E. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply according to SSPC-PA 1.

F. Welding Electrodes: Comply with AWS standards.

2.8 STAINLESS-STEEL CONNECTION MATERIALS

A. Stainless-Steel Plate: ASTM A 666, Type 304, Type 316, or Type 201.

B. Stainless-Steel-Headed Studs: ASTM A 276, Alloy 304 or Alloy 316, with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

2.9 BEARING PADS

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

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

2. Random-Oriented-Fiber-Reinforced Elastomeric Pads: Preformed, randomly oriented synthetic fibers set in elastomer. Type A durometer hardness of 70 to 90, ASTM D 2240; capable of supporting a compressive stress of 3000 psi with no cracking, splitting, or delaminating in the internal portions of pad. Test one specimen for every 200 pads used in Project.

3. Cotton-Duck-Fabric-Reinforced Elastomeric Pads: Preformed, horizontally layered cotton-duck fabric bonded to an elastomer; Type A durometer hardness of 80 to 100, ASTM D 2240; complying with AASHTO's "AASHTO LRFD Bridge Design Specifications," Division II, Section 18.10.2; or with MIL-C-882E.


2.10 ACCESSORIES

A. Reglets: Specified in Section 076200 "Sheet Metal Flashing and Trim."

B. Precast Accessories: Provide clips, hangers, high-density plastic or steel shims, and other accessories required to install architectural precast concrete units.

2.11 GROUT MATERIALS

A. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content less than 0.06 percent by weight of cement when tested according to ASTM C 1218/C 1218M.

2.12 INSULATED PANEL ACCESSORIES

A. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, Type IV, 1.55 lb/cu. ft. Type VI, 1.80 lb/cu. ft.; ship-lap edges; with thickness of 3 inches.

B. Wythe Connectors: Carbon-fiber grid manufactured to connect wythes of precast concrete panels.

2.13 CONCRETE MIXTURES

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

1. Use a single design mixture for units with more than one major face or edge exposed.
2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.

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

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

2. Maximum Water-Cementitious Materials Ratio: 0.45.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.

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

2.14 MOLD FABRICATION

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

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

1. Form joints are not permitted on faces exposed to view in the finished work.
2. Edge and Corner Treatment: Uniformly radiused 1/4 inch.

2.15 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld-headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."
B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

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

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

E. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
   1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.
   2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
   3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
   4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.

F. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.

G. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

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

I. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
   1. Place backup concrete mixture to ensure bond with face-mixture concrete.

J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
   1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.

K. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

L. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.
M. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

N. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.16 INSULATED PANEL CASTING

A. Cast, screed, and consolidate bottom concrete wythe supported by mold.

B. Place insulation boards abutting edges and ends of adjacent boards. Insert wythe connectors through insulation holes, and consolidate concrete around connectors according to connector manufacturer's written instructions.

C. Ensure bottom wythe and insulation layer are not disturbed after bottom wythe reaches initial set.

D. Cast, screed, and consolidate top wythe to meet required finish.

E. Maintain temperature below 150 deg F in bottom concrete wythe.

2.17 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with the following product tolerances:

1. Overall Height and Width of Units, Measured at the Face Exposed to View: As follows:
   a. 10 feet or under, plus or minus 1/8 inch.
   b. 10 to 20 feet, plus 1/8 inch, minus 3/16 inch.
   c. 20 to 40 feet, plus or minus 1/4 inch.
   d. Each additional 10 feet, plus or minus 1/16 inch.

2. Overall Height and Width of Units, Measured at the Face Not Exposed to View: As follows:
   a. 10 feet or under, plus or minus 1/4 inch.
   b. 10 to 20 feet, plus 1/4 inch, minus 3/8 inch.
   c. 20 to 40 feet, plus or minus 3/8 inch.
   d. Each additional 10 feet, plus or minus 1/8 inch.

3. Total Thickness or Flange Thickness: Plus 1/4 inch, minus 1/8 inch.
4. Rib Thickness: Plus or minus 1/8 inch.
5. Rib to Edge of Flange: Plus or minus 1/8 inch.
6. Distance between Ribs: Plus or minus 1/8 inch.
7. Variation from Square or Designated Skew (Difference in Length of the Two Diagonal Measurements): Plus or minus 1/8 inch/72 inches or 1/2 inch total, whichever is greater.
8. Length and Width of Block-outs and Openings within One Unit: Plus or minus 1/4 inch.
9. Location and Dimension of Block-outs Hidden from View and Used for HVAC and Utility Penetrations: Plus or minus 3/4 inch.
11. Haunch Bearing Surface Deviation from Specified Plane: Plus or minus 1/8 inch.
13. Bowing: Plus or minus L/360, maximum 1 inch.
14. Local Smoothness: 1/4 inch/10 feet.
15. Warping: 1/16 inch/12 inches of distance from nearest adjacent corner.
16. Tipping and Flushness of Plates: Plus or minus 1/4 inch.

B. Position Tolerances: For cast-in items measured from datum line location, as indicated on Shop Drawings.

1. Weld Plates: Plus or minus 1 inch.
2. Inserts: Plus or minus 1/2 inch.
3. Handling Devices: Plus or minus 3 inches.
4. Location of Rustication Joints: Plus or minus 1/8 inch.
5. Location of Opening within Panel: Plus or minus 1/4 inch.
6. Location of Flashing Reglets: Plus or minus 1/4 inch.
7. Location of Flashing Reglets at Edge of Panel: Plus or minus 1/8 inch.
8. Electrical Outlets, Hose Bibs: Plus or minus 1/2 inch.
9. Location of Bearing Surface from End of Member: Plus or minus 1/4 inch.
10. Allowable Rotation of Plate, Channel Inserts, and Electrical Boxes: 2-degree rotation or 1/4 inch maximum over the full dimension of unit.
11. Position of Sleeve: Plus or minus 1/2 inch.
12. Location of Window Washer Track or Buttons: Plus or minus 1/8 inch.

2.18 FINISHES

A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample sample panels and as follows:

1. Design Reference Sample - Typical "Textured" finish for insulated precast:
   a. Surface Texture: With Specified Form Liner.
   b. Basis of Design Color and texture Exterior Face:
      1) Color: March Architects Reference sample for limestone color.
      2) Acid Etch Finish: Match Architects Reference sample. Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.

2. Design Reference Sample - Smooth finish for "Faceted" insulated precast:
   a. Surface Texture: Smooth
   b. Basis of Design Color and texture Exterior Face:
      1) Color: March Architects Reference sample for limestone color.
      2) Acid Etch Finish: Match Architects Reference sample. Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.

3. Design Reference Sample - Smooth finish for custom precast roof pavers:
   a. Surface Texture: Smooth
   b. Basis of Design Color and texture Exterior Face:
      1) Color: March Architects Reference sample for limestone color.
      2) Acid Etch Finish: Match Architects Reference sample. Use acid and hot-water solution, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces. Protect hardware, connections, and insulation from acid attack.
c. Refer to Section 071418 "Cold Fluid-Applied Waterproofing Deck System."

B. Finish exposed exterior surfaces including tops bottoms, exposed edges, returns surfaces of architectural precast concrete units to match face-surface finish.

C. Finish exposed back (Interior) surfaces of architectural precast concrete units with smooth, steel-trowel and light blast finish.
   1. Abrasive-Blast Finish: Use abrasive grit, equipment, application techniques, and cleaning procedures to expose aggregate and surrounding matrix surfaces.
   2. Refer to Drawings for locations.

D. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

2.19 SOURCE QUALITY CONTROL


B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.
   1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

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

D. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M and ACI 318.
   1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Architect.
   2. Test cores in an air-dry condition.
   3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
   4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
      a. Project identification name and number.
      b. Date when tests were performed.
      c. Name of precast concrete fabricator.
      d. Name of concrete testing agency.
      e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
F. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

3.2 INSTALLATION

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

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

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified shall be continuous fillet welds, using no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil-thick coat of galvanized repair paint to galvanized surfaces according to ASTM A 780/A 780M.


5. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.

2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

   d. Direct-Tension Control Bolt: ASTM F 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

F. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of loadbearing precast concrete members.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.
3.5 REPAIRS

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.

D. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
   1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
   2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500
SECTION 042000 - 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. Decorative concrete masonry units.
   3. Mortar and grout.
   4. Steel reinforcing bars.
   5. Masonry joint reinforcement.
   6. Ties and anchors.
   7. Miscellaneous masonry accessories.

B. Related Sections:
   1. Section 055000 "Metal Fabrications" for furnishing steel lintels for unit masonry.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.

   1. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor’s expense.

   1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
   2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
   3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
   4. Prism Test: For each type of construction required, according to ASTM C 1314.
1.6 ACTION SUBMITTALS

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

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, “Details and Detailing of Concrete Reinforcement.” Show elevations of reinforced walls.

C. Samples for Verification: For each type and color of the following:

1. Decorative CMUs.
2. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Reuse: Documentation declaring products listed below are salvaged and/or refurbished materials. Document the origin and material cost of these materials:

C. Regional Materials: Manufacturer’s certificate demonstrating that each material or product indicated was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. Include material test reports substantiating compliance with requirements.
   b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.

3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.

4. Grout mixes. Include description of type and proportions of ingredients.

5. Reinforcing bars.


7. Anchors, ties, and metal accessories.

E. 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 for air content.

2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

G. Minutes of preinstallation conference.
1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. 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.

C. 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.

D. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical wall area as shown on Drawings.
2. Build mockups for each type of exposed unit masonry construction in sizes approximately 72 inches long by 60 inches high by full thickness, including face and backup wythes and accessories.
3. Clean one-half of exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. 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.
6. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.9 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 designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and 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.

1.10 PROJECT CONDITIONS

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

1. Extend cover a minimum of 24 inches 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 down face next to unconstructed wythe and hold cover in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
   1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.


PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90. [MA2]
   1. Density Classification: Normal weight.
   2. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
C. Decorative CMUs: ASTM C 90. [MA1]
   1. Products: Subject to compliance with requirements, provide the following:
      a. Trenwyth Trendstone ground face masonry units
   2. Density Classification: Normal weight.
   3. Size (Width): Manufactured to dimensions specified in "CMUs" Paragraph, and as shown in drawings.
   4. Pattern and Texture:
      a. Standard pattern, ground-face finish.
   5. Colors: Match Architect's samples.

2.3 MASONRY LINTELS
A. General: Provide one of the following:
B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs 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.
C. Masonry Lintel Finish: Match CMU finish to the wall they are located.

2.4 MORTAR AND GROUT MATERIALS
A. Regional Materials: Aggregate for mortar and grout shall be extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.
B. Mortar Cement: ASTM C 1329.
   1. Products: Subject to compliance with requirements, provide the following:
      a. Lafarge North America Inc.; Lafarge Mortar Cement or Magnolia Superbond Mortar Cement.
C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Davis Colors; True Tone Mortar Colors.
      b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
      c. Solomon Colors, Inc.; SGS Mortar Colors.
   2. Mortar color at decorative CMU to match the color of the masonry units.
D. Colored Cement Product: Packaged blend made from mortar cement and mortar pigments, all complying with specified requirements, and containing no other ingredients.
   1. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
   2. Pigments shall not exceed 10 percent of portland cement by weight.
   3. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
E. 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 thick, use aggregate graded with 100 percent passing the No. 16 sieve.
   3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. 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.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Euclid Chemical Company (The); Accelguard 80.
      c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

H. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
   1. Intermediate Walls: Hot-dip galvanized, carbon steel.
   2. Wire Size for Side Rods: 0.187-inch diameter.
   4. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
   5. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
   2. Stainless-Steel Wire: ASTM A 580/A 580M, [Type 304] [Type 316].
   4. Stainless-Steel Sheet: ASTM A 666, [Type 304] [Type 316].
   5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 7.6 to 12.7 mm and an amplitude of 0.06 to 0.10 inch made from 0.030-inch-thick, steel sheet, galvanized after fabrication.

C. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 1/4-inch diameter, hot-dip galvanized steel wire. Mill-galvanized wire ties may be used in interior walls unless otherwise indicated.

E. Partition Top Anchors: 0.105-inch thick metal plate with 3/8-inch diameter metal rod 6 inches 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 bent to configuration indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
   c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
   d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.8 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Diedrich Technologies, Inc.
   b. EaCo Chem, Inc.
   c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use masonry cement or mortar cement mortar unless otherwise indicated.
3. For reinforced masonry, use or mortar.
4. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
B. 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 or needed to provide required compressive strength of masonry.

1. For reinforced masonry, use Type S.
2. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
3. For interior non-load-bearing partitions, Type O may be used instead of Type N.

C. 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 5 percent of masonry cement or mortar cement by weight.
2. Mix to match Architect's sample.
3. Application: Use pigmented mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.

D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.
2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
   a. Decorative CMUs.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
3. Provide grout with a slump of 8 to 11 inches 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 work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

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 the 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.

1. 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 or minus 1/4 inch.
2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

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

3.4 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 running bond with 8 x 16 inch units; do not use units with less than nominal 4-inch 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 [2 inches] [4-inches]. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking 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. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.

2. Wedge non-load-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.

3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.

2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.

3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

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 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. Allow cleaned surfaces to dry before setting.
   3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 16 inches o.c.
   2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

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

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:
   1. 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 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.
   3. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
   1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 LINTELS

A. Install steel lintels where indicated.
B. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 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 other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

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 ACI 530.1/ASCE 6/TMS 602 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 56 inches.

3.10 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 the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.

2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

H. Prism Test: For each type of construction provided, according to ASTM C 1314 at [7 days and at ]28 days.
3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 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. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 “Earth Moving.”
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000
SECTION 051200 - STRUCTURAL STEEL FRAMING

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. Structural steel.
   2. Field-installed shear connectors.
B. Related Requirements:
   1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
   2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
   3. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications not defined as structural steel.
   4. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" and Section 099600 "High-Performance Coatings" for surface-preparation and priming requirements.

1.3 DEFINITIONS
A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
C. Heavy Sections: Rolled and built-up sections as follows:
   1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches (38 mm).
   2. Welded built-up members with plates thicker than 2 inches (50 mm).
   3. Column base plates thicker than 2 inches (50 mm).

1.4 COORDINATION
A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers’ written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.
1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Shop Drawings: Show fabrication of structural-steel components.
   1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
   2. Include embedment Drawings.
   3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
   4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
   5. Identify members and connections of the Seismic-Load-Resisting System.
   6. Indicate locations and dimensions of protected zones.
   7. Identify demand critical welds.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
   1. Power source (constant current or constant voltage).
   2. Electrode manufacturer and trade name, for demand critical welds.

D. Mill test reports for structural steel, including chemical and physical properties.

E. Product Test Reports: For the following:
   1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
   2. Direct-tension indicators.
   3. Tension-control, high-strength, bolt-nut-washer assemblies.
   4. Shear stud connectors.
   5. Shop primers.

F. Survey of existing conditions.

G. Source quality-control reports.

H. Field quality-control and special inspection reports.
1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE or Category CSE.

C. Shop-Painting Applicators: Qualified according to AISC’s Sophisticated Paint Endorsement P1, Endorsement P2, Endorsement P3 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators.”


1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.
3. AISC 360.
4. RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.”

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer’s labels intact.

1. Fasteners may be repackaged provided Owner’s testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

C. Plate and Bar: ASTM A 36/A 36M.

D. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50 (345).
E. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.

F. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

G. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
   1. Weight Class: Standard.
   2. Finish: Black except where indicated to be galvanized.

H. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

I. Steel Forgings: ASTM A 668/A 668M.

J. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, (ASTM A 563M, Class 8S) heavy-hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M), Type 1, hardened carbon-steel washers; all with plain finish.
   1. Direct-Tension Indicators: ASTM F 959, Type 325 (ASTM F 959M, Type 8.8), compressible-washer type with plain finish.

B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
   1. Finish: Plain.

C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

D. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.
   5. Finish: Plain.

E. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.
   3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.

F. Threaded Rods: ASTM A 36/A 36M.
   3. Finish: Plain.

G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

H. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

J. Structural Slide Bearings: Low-friction assemblies, of configuration indicated, that provide vertical transfer of loads and allow horizontal movement perpendicular to plane of expansion joint while resisting movement within plane of expansion joint.
1. Matting Surfaces: PTFE and PTFE.
2. Coefficient of Friction: Not more than 0.05.
3. Design Load: Not less than 6,000 psi (41 MPa)
4. Total Movement Capability: 2 inches (50 mm).

2.3 PRIMER

A. Primer: Comply with Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches (250 mm) o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
   1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
   2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
   3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC’s “Specification for Structural Joints Using ASTM A 325 or A 490 Bolts” for type of bolt and type of joint specified.
   1. Joint Type: Snug tightened. Unless specifically noted otherwise.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
   1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:
   1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches (50 mm).
   2. Surfaces of high-strength bolted, slip-critical connections.
   3. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
   1. SSPC-SP 2, “Hand Tool Cleaning.”
   2. SSPC-SP 3, “Power Tool Cleaning.”
   3. SSPC-SP 7/NACE No. 4, “Brush-off Blast Cleaning.”
   4. SSPC-SP 11, “Power Tool Cleaning to Bare Metal.”
   5. SSPC-SP 14/NACE No. 8, “Industrial Blast Cleaning.”
   6. SSPC-SP 6/NACE No. 3, “Commercial Blast Cleaning.”
   8. SSPC-SP 5/NACE No. 1, “White Metal Blast Cleaning.”
   9. SSPC-SP 8, “Pickling.”

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 2.0 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 2.0 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
   1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
   2. Galvanize lintels, shelf angles, and welded door frames attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform shop tests and inspections.
   1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
   1. Liquid Penetrant Inspection: ASTM E 165.
   2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
   4. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

E. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.


1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

   1. Joint Type: Snug tightened. Unless specifically noted otherwise.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

   1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
   2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.

3.5 PREFABRICATED BUILDING COLUMNS

A. Install prefabricated building columns to comply with AISC 360, manufacturer’s written recommendations, and requirements of testing and inspecting agency that apply to the fire-resistance rating indicated.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner may engage a qualified special inspector to perform the following special inspections:

   1. Verify structural-steel materials and inspect steel frame joint details.
   2. Verify weld materials and inspect welds.
   3. Verify connection materials and inspect high-strength bolted connections.

B. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

C. Bolted Connections: Inspect bolted connections according to RCSC’s "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

   1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency’s option:

      a. Liquid Penetrant Inspection: ASTM E 165.
      b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
      c. Ultrasonic Inspection: ASTM E 164.
      d. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

   1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
   2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
3.7 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 “Exterior Painting” and Section 099123 “Interior Painting.”

D. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 “High-Performance Coatings.”

END OF SECTION 051200
SECTION 052100 - STEEL JOIST FRAMING

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. LH- and DLH-series long-span steel joists.
      2. Joist accessories.
   B. Related Requirements:
      1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
      2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
      3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS
   A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
   B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS
   A. Product Data: For each type of joist, accessory, and product.
   B. Shop Drawings:
      1. Include layout, designation, number, type, location, and spacing of joists.
      2. Include joining and anchorage details; bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
      3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For manufacturer and professional engineer.
   B. Welding certificates.
   C. Manufacturer certificates.
   D. Mill Certificates: For each type of bolt.
E. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional 
engineer responsible for its preparation.

F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with 
applicable standard specifications and load tables in SJI's "Specifications."

1. Manufacturer's responsibilities include providing professional engineering services for designing 
special joists to comply with performance requirements.

B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, 
"Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle joists as recommended in SJI's "Specifications."

B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Canam Steel Corporation

B. CMC Joist & Deck

C. Gooder-Henrichsen Co.

D. New Millennium Building

E. Structures of U.S.A., Inc.

F. Valley Joist

G. Vulcraft; Nucor Vulcraft

2.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide special joists and connections capable of withstanding design loads 
indicated.

1. Use ASD; data are given at service-load level.
2. Design special joists to withstand design loads with live-load deflections no greater than the following:

2.3 LONG-SPAN STEEL JOISTS
   A. Manufacture steel joists according to "Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
      2. End Arrangement: Underslung.
      3. Top-Chord Arrangement: Parallel.

   B. Provide holes in chord members for connecting and securing other construction to joists.

   C. Camber long-span steel joists as indicated.

   D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches (1:48).

2.4 PRIMERS
   A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

   B. Primer: Provide shop primer that complies with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting and Section 099600 "High-Performance Coatings."

2.5 JOIST ACCESSORIES
   A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.

   B. Bridging: Schematically indicated. Detail and fabricate according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

   C. Bridging: Fabricate as indicated and according to SJI's "Specifications." Furnish additional erection bridging if required for stability.

   D. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Shop prime paint.

   E. Steel bearing plates with integral anchorages are specified in Section 055000 "Metal Fabrications."

   F. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch (13 mm) of finished wall surface unless otherwise indicated.


   G. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; ASTM A 563 (ASTM A 563M) heavy hex carbon-steel nuts; and ASTM F 436 (ASTM F 436M) hardened carbon-steel washers.
1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C
   
   H. Welding Electrodes: Comply with AWS standards.
   
   I. Galvanizing Repair Paint: ASTM A 780/A 780M.
   
   J. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

   A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
   
   B. Do not prime paint joists and accessories to receive sprayed fire-resistant materials.
   
   C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil (0.025 mm) thick.
   
   D. Shop priming of joists and joist accessories is specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting and Section 099600 "High-Performance Coatings."

PART 3 - EXECUTION

3.1 EXAMINATION

   A. Examine supporting substrates, embedded bearing plates, and abutting structural framing 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. Do not install joists until supporting construction is in place and secured.
   
   B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written instructions, and requirements in this Section.

   1. Before installation, splice joists delivered to Project site in more than one piece.
   2. Space, adjust, and align joists accurately in location before permanently fastening.
   3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
   4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
   
   C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   
   D. Bolt joists to supporting steel framework using carbon-steel bolts.
E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with RCSC's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.

F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

B. Visually inspect field welds according to AWS D1.1/D1.1M.

1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, at testing agency's option:
   a. Liquid Penetrant Inspection: ASTM E 165/E 165M.
   b. Magnetic Particle Inspection: ASTM E 709.

C. Visually inspect bolted connections.

D. Prepare test and inspection reports.

3.4 PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.

1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2 or power-tool cleaning according to SSPC-SP 3.
2. Apply a compatible primer of same type as primer used on adjacent surfaces.

C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting Section 099600 "High-Performance Coatings."

END OF SECTION 052100
SECTION 053100 - STEEL DECKING

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. Composite deck.
   2. Noncomposite form deck.
B. Related Requirements:
   1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
   2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
   3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
   5. Section 099123 "Interior Painting" for repair painting of primed deck and finish painting of deck.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of deck, accessory, and product indicated.
B. Sustainable Design Submittals:
C. Shop Drawings:
   1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS
A. Welding certificates.
B. Product Certificates: For each type of steel deck.
C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   1. Power-actuated mechanical fasteners.
   2. Acoustical roof deck.
D. Evaluation Reports: For steel deck.
E. Field quality-control reports.
1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

C. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.


1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. 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 COMPOSITE DECK

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

1. ASC Profiles, Inc.; a Blue Scope Steel company.
2. Canam United States; Canam Group Inc.
3. CMC Joist & Deck.
5. Cordeck.
6. DACS, Inc.
8. Marilyn Steel Decks, Inc.
9. New Millennium Building Systems, LLC.
11. Roof Deck, Inc.
13. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

B. Composite Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
   1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 \((230)\), G60 \((Z180)\) zinc coating.
   2. Profile Depth: As indicated.
   3. Design Uncoated-Steel Thickness: As indicated.
   4. Span Condition: As indicated.

2.3 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 \((4.8\text{-mm})\) minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi \((230\text{ MPa})\), not less than 0.0359-inch \((0.91\text{-mm})\) design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi \((230\text{ MPa})\), of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, \([0.0598\text{ inch (1.52 mm)}]\) \([0.0747\text{ inch (1.90 mm)}]\) thick, with factory-punched hole of 3/8-inch \((9.5\text{-mm})\) minimum diameter.

J. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch \((1.90\text{ mm})\) thick, of same material and finish as deck. For drains, cut holes in the field.


L. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
   1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches (38 mm) long, and as follows:
   1. Weld Diameter: 5/8 inch (16 mm), nominal.
   2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
   3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches (457 mm), and as follows:
   1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
   2. Mechanically clinch or button punch.
   3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:
   1. End Joints: Lapped 2 inches (51 mm) minimum.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches (305 mm) apart with at least one fastener at each corner.
1. Install reinforcing channels or zees in ribs to span between supports and weld or mechanically fasten.

E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

G. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Section.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch (16 mm), nominal.
2. Weld Spacing: Space and locate welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches (914 mm), and as follows:

1. Mechanically fasten with self-drilling, No. 10 (4.8-mm-) diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- (38-mm-) long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm), with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches (355 mm) apart in both directions, within 9 inches (228 mm) of walls at ends, and not more than 12 inches (305 mm) from walls at sides unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner may engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.
3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
   1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
   2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100
SECTION 054000 - 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Exterior non-load-bearing wall framing.
   2. Ceiling joist framing.
   3. Interior Soffit framing.

B. Related Requirements:
   1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
   2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.
   3. Section 092216 "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:
   1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
   2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

A. Delegated-Design Submittal: For gypsum board walls and special acoustic configurations, including Traditional Performance Space 132, Large IRR 130, and Live Room/Jazz Combo Rehearsal 182. Delegated-Design to comply with interior stud framing performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For testing agency.
C. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

D. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

1. <Insert Local/Regional Material>.

E. Welding certificates.

F. Product Test Reports: For each listed product, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

1. Steel sheet.
2. Expansion anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. Welding Qualifications: Quality procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkWestern Building Systems, Inc.
4. Consolidated Fabricators Corp.; Building Products Division.
2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section "MU General Conditions or the Contract for Construction," to design cold-formed steel framing.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.
2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
   a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
   a. Upward and downward movement of 1/2 inch.
5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

C. Cold-Formed Steel Framing Design Standards:

1. Wall Studs: AISI S211.

D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
2.3 COLD-FORMED STEEL FRAMING, GENERAL

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
   1. Grade: As required by structural performance.
   2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.

C. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.

2.5 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, punched with standard holes, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.

2.6 SOFFIT FRAMING

A. Interior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0538 inch.
2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

B. Provide accessories of 0.0677" minimum thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips and plates.
5. End clips.
6. Foundation clips.
7. Stud kickers and knee braces.
8. Hole reinforcing plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, 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 per ASTM E 488 conducted by a qualified testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

A. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
   B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
   C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
      1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
      2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL
   A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
   B. Install cold-formed steel framing according to AISI S200 and to manufacturer’s written instructions unless more stringent requirements are indicated.
   C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
      1. Cut framing members by sawing or shearing; do not torch cut.
      2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
         a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
         b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
   D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

### 3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track unless otherwise indicated. Space studs as follows:


C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deep-leg deflection tracks and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

a. Install solid blocking at centers indicated.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

### 3.4 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.
B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
   1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
   2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

D. Frame openings with built-up joist headers consisting of joist and joist track, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.
   1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:
   1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.
SECTION 055000 - METAL FABRICATIONS

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. Steel framing and supports for countertops.
   2. Steel framing and supports for mechanical and electrical equipment.
   3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   4. Elevator machine beams, hoist beams.
   5. Steel shapes for supporting elevator door sills.
   7. Metal ladders.
   8. Ladder safety cages.
   9. Metal ships' ladders.
   10. Miscellaneous steel trim.
   11. Loose bearing and leveling plates for applications where they are not specified in other Sections.
   12. Skateboard deterrents.

B. Products furnished, but not installed, under this Section:
   1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:
   1. Section 033000 "Cast-In-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
   3. Section 051200 "Structural Steel Framing."
   4. Section 055100 "Metal Stairs."
   5. Section 055213 "Pipe and Tube Railings."
   6. Section 055300 "Metal Gratings."
   7. Section 057300 "Decorative Metal Railings."

1.3 ACTION SUBMITTALS
A. Product Data:  For the following:
   1. Paint products.
   2. Grout.

B. Shop Drawings:  Show fabrication and installation details for metal fabrications.
1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

C. Low-Emitting Materials - Paints and Coatings: Include manufacturer's printed statement of VOC content in g/L and Material Safety Data Sheet for each interior paint and coating.

1. Provide quantity take offs for each interior finish paint, coating, and primer.

D. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.

E. Welding certificates.

F. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Paints and Coatings: Provide quantity of each interior finish coating, paint, and primer used.

1.6 QUALITY ASSURANCE


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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 PROJECT CONDITIONS

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

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design ladders and ships ladder, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.3 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 316L.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 316L.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.197-inch nominal thickness.
   3. Include end caps
   4. Concrete Insert Series: P3200 Series – Pre galvanized finish – include end caps and back plates -cut to length as indicated on plans.
2.4 NONFERROUS METALS


2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1.

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
   1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: 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/E 488M, conducted by a qualified independent testing agency.

F. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

G. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

H. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.6 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Section 099600 “High-Performance Coatings.”

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

F. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.7 FABRICATION, GENERAL

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

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Furnish inserts for units installed after concrete is placed.
METAL FABRICATIONS

2.9 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with primer specified in Section 099600 "High-Performance Coatings."

2.10 METAL LADDERS

A. General:

1. Comply with ANSI A14.3 unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Steel Ladders:

1. Space siderails 16 inches apart unless otherwise indicated.
2. Space siderails of elevator pit ladders 12 inches apart.
4. Rungs: 3/4-inch diameter steel bars.
5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
6. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
7. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

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

      1) IKG Industries, a division of Harsco Corporation; Mebac.
      2) SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.

8. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch in least dimension.
9. Support each ladder at top and bottom and not more than 60 inches o.c. with welded or bolted steel brackets.
10. Galvanize ladders, including brackets and fasteners.
2.11 LADDER SAFETY CAGES

A. General:
   1. Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or with stainless-steel fasteners.
   2. Provide primary hoops at tops and bottoms of cages and spaced not more than 20 feet o.c. Provide secondary intermediate hoops spaced not more than 48 inches o.c. between primary hoops.
   3. Fasten assembled safety cage to ladder rails and adjacent construction by welding or with stainless-steel fasteners unless otherwise indicated.

B. Steel Ladder Safety Cages:
   1. Primary Hoops: 1/4-by-4-inch flat bar hoops.
   3. Vertical Bars: 3/16-by-1-1/2-inch flat bars secured to each hoop.
   4. Galvanize ladder safety cages, including brackets and fasteners.
   5. Prime ladder safety cages, including brackets and fasteners, with [zinc-rich primer.] [primer specified in Section 099600 "High-Performance Coatings."]

2.12 METAL SHIPS’ LADDERS

A. Provide metal ships’ ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.
   1. Fabricate ships’ ladders, including railings from steel.
   2. Fabricate treads and platforms from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than 1/2 inch in least dimension.

B. Prime steel ships’ ladders, including treads, railings, brackets, and fasteners, with primer specified in Section 099600 "High-Performance Coatings."

2.13 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.
   1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with primer specified in Section 099600 "High-Performance Coatings."

2.14 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.
B. Galvanize plates.

C. Prime plates with primer specified in Section 099600 "High-Performance Coatings."

2.15 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.16 SKATEBOARD DETERRENTS

A. General: Fabricate deterrents to design indicated from stainless steel plate of sizes and thickness as shown on drawings. Form steel plate by cutting, bending, drilling, and mitering to dimensions indicated on drawings.

2.17 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.18 STEEL AND IRON FINISHES

A. 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.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with primers specified in Section 099600 "High-Performance Coatings".

D. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
   1. Cast Aluminum: Heavy coat of bituminous paint.
   2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 INSTALLING BEARING AND LEVELING PLATES


B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

   1. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
3.4 INSTALLING SKATE BOARD DETERENTS

A. Sawcut as necessary to install skateboard deterrents at locations indicated on drawings.

B. Install epoxy sealant on all sides to prevent water entry.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting:  Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 “High-Performance Coatings.”

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000
SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Stairs with concrete treads.
B. Structural steel stair framing and supports.
C. Handrails and guards specified in Section 05 52 13, Pipe and Tube Railing.

1.02 SUBMITTALS

A. See Division One, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
   2. Include the design engineer’s stamp or seal on each sheet of shop drawings.
C. Delegated Design Data: As required by authorities having jurisdiction.
D. Welders’ Certificates.
E. Fabricator’s Qualification Statement: Provide documentation showing steel fabricator is certified under AISC 201.

1.03 QUALITY ASSURANCE

A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.
B. Welder Qualifications: Show certification of welders employed on the Work, verifying AWS qualification within the previous 12 months.
C. Fabricator Qualifications:
   1. A qualified steel fabricator that is certified by the American Institute for Steel Construction (AISC) under AISC 201.
   2. A company specializing in manufacturing products specified in this section, with not less than ten years of documented experience.

PART 2 - PRODUCTS

2.01 METAL STAIRS – GENERAL

A. Metal Stairs: Provide stairs of the design specified, complete with landing platforms, vertical and horizontal supports, fabricated accurately for anchorage to each other and to building structure.
   1. Regulatory Requirements: Provide stairs and railings complying with the most stringent requirements of local, state, and federal regulations; where requirements of the contract documents exceed those of regulations, comply with the contract documents.
   2. Structural Design: Provide complete stair assemblies complying with the applicable local code.
3. Dimensions: As indicated on drawings.
4. Shop assemble components; disassemble into largest practical sections suitable for transport and access to site.
5. No sharp or rough areas on exposed travel surfaces and surfaces accessible to touch.
6. Separate dissimilar metals using paint or permanent tape.

B. Metal Jointing and Finish Quality Levels:

1. Architectural: All joints as inconspicuous as possible, whether welded or mechanical.
   
   a. Welded Joints: Continuously welded and ground smooth and flush.
   b. Mechanical Joints: Butted tight, flush, and hairline; concealed fastenings only.
   c. Exposed Edges and Corners: Eased to small uniform radius.
   d. Metal Surfaces to be Painted: Sanded or ground smooth, suitable for highest quality gloss finish.

C. Fasteners: Same material or compatible with materials being fastened; type consistent with design and specified quality level.

D. Anchors and Related Components: Same material and finish as item to be anchored, except where specifically indicated otherwise; provide all anchors and fasteners required.

2.02 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.
   5. Limit deflection of treads, platforms, and framing members to L/240 or 1/4 inch (6.4 mm), whichever is less.

C. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

   1. Handrails and Top Rails of Guards:
      
      a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
      b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
      c. Uniform and concentrated loads need not be assumed to act concurrently.

   2. Infill of Guards:
      
      a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
      b. Infill load and other loads need not be assumed to act concurrently.

2.03 METAL STAIRS WITH CONCRETE TREADS

A. Jointing and Finish Quality Level: Architectural, as defined above.
B. Risers: Closed.
C. Treads: Metal pan with field-installed concrete fill.
   1. Concrete Depth: 1-1/2 inches, minimum.
   2. Tread Pan Material: Steel sheet.
   3. Tread Pan Thickness: As required by design; 14 gage, 0.075 inch minimum.
   4. Pan Anchorage to Stringers: Continuously welded, from top or bottom.
   5. Concrete Reinforcement: None.
   6. Concrete Finish: Steel troweled.

D. Risers: Same material and thickness as tread pans.
   1. Nosing Depth: Not more than 1 inch overhang.
   2. Nosing Return: Flush with top of concrete fill, not more than 1/2 inch wide.

E. Stringers: Rolled steel channels.
   1. Stringer Depth: 12 inches minimum, or as shown on drawings.
   2. End Closure: Sheet steel of same thickness as risers welded across ends.

F. Railings: Steel pipe railings.
G. Finish: Shop- or factory-prime painted.
H. Under Side of Stair: Exposed to view, to be finished same as specified for other exposed to view surfaces.

2.04 HANDRAILS AND GUARDS
A. Wall-Mounted Rails: As specified in Section 05 52 13, Pipe and Tube Railings.
B. Guards: Pipe railings as specified in Section 05 52 13, Pipe and Tube Railings.

2.05 MATERIALS
A. Steel Sections: ASTM A36/A36M.
B. Steel Plates: ASTM A6/A6M or ASTM A283/A283M.
C. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
   1. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
   2. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
D. Concrete Fill: Type specified in Section 03 30 00.

2.06 ACCESSORIES
A. Steel Bolts, Nuts, and Washers: ASTM A325 (ASTM A325M), Type 1.
B. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
C. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
2.07 SHOP FINISHING

A. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
B. Do not prime surfaces in direct contact with concrete or where field welding is required.
C. Prime Painting: Use specified shop- and touch-up primer.
   1. Preparation of Steel: In accordance with SSPC-SP 2, Hand Tool Cleaning.
   2. Number of Coats: One.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

A. When field welding is required, clean and strip primed steel items to bare metal.
B. Supply items required to be cast into concrete and embedded in masonry with setting templates.
C. Grind, file and sand as required to remove all rough, un-even, sharp protrusions such as weld splatter or other inconsistencies as required to provide a smooth surface on all exposed components. Coordinate with Section 09 90 00, Painting and Coating.

3.03 INSTALLATION

A. Install components plumb and level, accurately fitted, free from distortion or defects.
B. Provide anchors, plates, angles, hangers, struts, and other miscellaneous items required for connecting stairs to structure.
C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
D. Provide welded field joints where specifically indicated on shop drawings. Perform field welding in accordance with AWS D1.1/D1.1M.
E. Other field joints may be either welded or bolted provided the result complies with the limitations specified for jointing quality levels.
F. Obtain approval prior to site cutting or creating adjustments not scheduled.
G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.

3.04 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION 055100
SECTION 055213 - PIPE AND TUBE RAILINGS

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. Steel pipe railings.

B. Related Sections:
   1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
   2. Section 092216 "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of mechanically connected railings.
   2. Railing brackets.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples for Verification: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.

1.4 INFORMATIONAL SUBMITTALS

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

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.
   1. Pipe and tube railings.
1.5 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:

1. Metal to Metal Adhesives: 30 g/L.


C. Source Limitations: Obtain each type of railing from single source from single manufacturer.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. 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.

C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Steel: 72 percent of minimum yield strength.

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ft applied in any direction.
   b. Concentrated load of 200 lbf 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 applied horizontally on an area of 1 sq. ft.
b. Infill load and other loads need not be assumed to act concurrently.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 METALS, GENERAL
A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON
A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
B. 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.

1. Provide galvanized finish for exterior installations and where indicated.
C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS
A. General: Provide the following:

1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.
B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
D. Post-Installed Anchors: Torque-controlled expansion 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.

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

C. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

2.6 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

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 flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA’s "Voluntary Joint Finish Standards" for Type 1 welds; no evidence of a welded joint.

I. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows:
1. As detailed.

K. Close exposed ends of railing members with prefabricated end fittings.

L. 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 or less.

M. 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 to plaster or 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.

N. 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.

O. For railing posts set in concrete, provide steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.7 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.8 STEEL AND IRON FINISHES

A. Galvanized Railings:

1. Hot-dip galvanize exterior steel and iron railings, including hardware, after fabrication.
2. Hot-dip galvanize indicated steel and iron railings, including hardware, after fabrication.
5. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
6. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

D. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

1. Shop prime uncoated railings with primers specified in Section 099600 "High-Performance Coatings."
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL
A. Fit exposed connections together to form tight, hairline joints.
B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
   1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
   3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS
A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING RAILINGS
A. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
   1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
   2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
B. Secure wall brackets and railing end flanges to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.5 ADJUSTING AND CLEANING

A. Clean by washing thoroughly with clean water and soap and rinsing with clean water.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 "High-Performance Coatings."

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.6 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
SECTION 055300 - METAL GRATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Drawings and general provisions of the Contract, including General and Special Conditions within Division 01 Specification Section, apply to this Section.

1.2 SUMMARY
   A. Section Includes;
      1. Metal bar gratings
   B. Related Sections:
      1. Section 05 12 00 "Structural Steel Framing" for structural steel framing system components.
      2. Section 05 50 00 "Metal Fabrications" for structural steel framing system components

1.3 ACTION SUBMITTALS
   A. Product Data: For the following:
      2. Paint products.
   B. Shop Drawings: Include plans, sections, details, and attachments to other work.

1.4 INFORMATIONAL SUBMITTALS
   A. Welding certificates.

1.5 QUALITY ASSURANCE
   A. Metal Bar Grating Standards: Comply with NAAMM MBG 531, A"Metal Bar Grating Manual" and NAAMM MBG 532, "Heavy-Duty Metal Bar Grating Manual".
   B. Welding Qualifications: Qualify procedures and personnel according to the following:
      1. AWS D1.1/D1.1M, "Structural Welding Code - Steel".

1.6 PROJECT CONDITIONS
   A. Field Measurements: Verify actual locations of walls and other construction contiguous with gratings by field measurements before fabrication.
1.7 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for gratings, grating frames, and supports. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Gratings shall withstand the effects of gravity loads and stresses within limits.

2.2 ALUMINUM

A. Aluminum, General: Provide alloy and temper recommended by aluminum producer for type of use indicated, and with not less than the strength and durability properties of alloy and temper designated below for each aluminum form required.

B. Extruded Bars and Shapes: ASTM B221, alloys as follows:

1. 6061-T6 or 6063-T6, for bearing bars of gratings and shapes.
2. 6061-T1, for grating crossbars.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide [Type 304] [Type 316] stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.

B. Post-Installed Anchors: Torque-controlled expansion anchors or 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. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy that is welded.

2.5 FABRICATION

A. Shop Assembly: Fabricate grating sections 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.
B. Cut, drill and punch material cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form from materials of size, thickness and shapes indicated, but no less than that needed to support indicated loads.

D. Fit exposed connections accurately together to form hairline joints.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space the anchoring devices to secure gratings, frames, and supports rigidly in place to support indicated loads.

2.6 METAL BAR GRATINGS

A. Available Manufacturers: Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

2. IKG Industries; a division of Harsco Corporation
3. Ohio Gratings, Inc.

B. Pressure-Locked, Aluminum I-Bar Grating [MG1]: Fabricated by swaging crossbars between bearing bars.

1. Bearing Bar Spacing: 1-3/16 inches o.c.
2. Bearing Bar Depth: 1-1/4 inches
3. Bearing Bar Flange Width: 3/16 inch
4. Crossbar Spacing: 4 inches o.c.
5. Traffic Surface: Grooved
6. Aluminum Finish: Mill finish

C. Removable Grating Sections: Fabricate with banding bars attached by welding to entire perimeter of each section. Include anchors and fasteners of type indicated or, if not indicated, as recommended by manufacturer for attaching to supports.

1. Provide no fewer than flange blocks for each section of aluminum I-bar grating, with block designed to fit over lower flange of I-beam bearing bars.
2. Furnish galvanized malleable-iron flange clamp with galvanized bolt for securing grating to supports. Furnish as a system designed to be installed from above grating by one person.

   a. Available Product: Subject to compliance with requirements, a product that may be incorporated into the Work includes, but is not limited to “Grate-Fast” by Lindapter North America, Inc.

D. Fabricate cutouts in grating sections for penetrations indicated. Arrange cutouts to permit grating removal without disturbing items penetrating gratings.

1. Edge-band openings in grating that interrupt four or more bearing bars with bars of same size and material as bearing bars.

E. Do not notch bearing bars at supports to maintain elevation.

2.7 STEEL FINISHES

A. Comply with NAAMM’s "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish gratings, frames, and supports after assembly.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing gratings to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling and fitting required for installing gratings. Set units accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.

D. Fit exposed connections accurately together to form hairline joints.

E. Attache toeplates to gratings by welding at locations indicated.

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.

3.2 INSTALLING METAL BAR GRATINGS

A. General: Install gratings to comply with recommendations of referenced metal bar grating standards that apply to grating types and bar sized indicated, including installation clearances and standard anchoring details.

B. Attach removable units to supporting members with type and size of clips and fasteners indicated or, if not indicated, as recommended by grating manufacturer for type of installation conditions shown.

C. Attach nonremovable units to supporting members by welding where both materials are same; otherwise, fasten by bolting as indicated above.

3.3 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field weld, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055300
SECTION 057000 - DECORATIVE METAL

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 fin tube cover plate
B. Related Sections:
   1. Section 055000 "Metal Fabrications" for non-decorative metal fabrications.

1.3 ACTION SUBMITTALS
A. Shop Drawings: Show fabrication and installation details for decorative fin tube metal cover plate.
   1. Include plans, elevations, component details, and attachments to other work.
   2. Indicate materials and profiles of each decorative metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified fabricator.
B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.
C. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

1.5 QUALITY ASSURANCE
A. Fabricator Qualifications: A firm experienced in producing decorative metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Store decorative metal in a well-ventilated area, away from uncured concrete and masonry, and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

B. Deliver and store cast-metal products in wooden crates surrounded by sufficient packing material to ensure that products will not be cracked or otherwise damaged.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with decorative metal by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Pattern: Perforated fin tube cover plate, 3/16 inch. Refer to construction drawings.

2.2 FASTENERS

A. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.

B. Provide concealed fasteners for interconnecting components and for attaching decorative metal cover plate.

2.3 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Section 099600 "High-Performance Coatings."

2.4 FABRICATION, GENERAL

A. Assemble items in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form decorative metal to required shapes and sizes, true to line and level with true curves and accurate angles and surfaces. Finish exposed surfaces to smooth, sharp, well-defined lines and arris.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
E. Mill joints to a tight, hairline fit. Cope or miter corner joints. Fabricate connections that will be exposed to weather in a manner to exclude water.

2.5 FINISHES, GENERAL
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

2.6 STEEL AND IRON FINISHES
A. Preparing Nongalvanized Items for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
B. Primer Application: Apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated ferrous-metal surfaces with primers specified in Section 099600 "High-Performance Coatings."

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

3.2 INSTALLATION, GENERAL
A. Provide anchorage devices and fasteners where needed to secure decorative perforated fin tube metal cover plate to in-place construction.
B. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals.
C. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
D. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.
1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.
3.3 INSTALLING DECORATIVE MECHANICAL GRILLES

A. Mount decorative perforated fin tube cover plate at heights and in positions indicated, adjusting ductwork to be centered on grilles if any.

3.4 CLEANING AND PROTECTION

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099600 “High-Performance Coatings.”

C. Protect finishes of decorative metal from damage during construction period with temporary protective coverings approved by decorative metal fabricator. Remove protective covering at time of Substantial Completion.

D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057000
SECTION 057300 - DECORATIVE METAL RAILINGS

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 supported railings.
   2. Illuminated decorative railings.
   3. Decorative railings.

B. Related Sections:
   1. Section 055100 "Metal Stairs".
   2. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring railings.
   3. Section 092216 "Non-Structural Metal Framing" for metal backing for anchoring railings.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas, pedestrian guidance and support, visual separation, or wall protection.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Manufacturer's product lines of railings assembled from standard components.
   2. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. For illuminated railings, include wiring diagrams and roughing-in details.

C. Samples for Verification: For each type of exposed finish required.
   1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
   2. Each type of glass required.
   3. Fittings and brackets.
   4. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.
1.5 INFORMATIONAL SUBMITTALS

A. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer in the State of <State of project> responsible for their preparation.

B. Qualification Data: For qualified professional engineer.

C. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

D. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

E. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive, sealant, and sealant primer.
   1. Provide quantity take offs for each adhesive, sealant, and sealant primer.

F. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.

H. Minutes of preinstallation conference.

1.6 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives and Sealants: Provide quantity of each interior adhesive, sealant and sealant primer used.

1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives and Sealants: Use interior adhesives, sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:
   1. Multipurpose Construction Adhesives: 70 g/L.
   2. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
   3. Architectural Sealants: 250 g/L.
   4. Architectural Non-porous Sealant Primers: 250 g/l.

B. Source Limitations: Obtain each type of railing from single source from single manufacturer.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. Refer to Section 016000 "Product Requirements."
   1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.
D. Safety Glazing Labeling: Permanently mark glass 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.

E. 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.

F. Preinstallation Conference: Conduct conference at Project site.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.9 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not suit structural performance requirements.

C. Coordinate electrical termination, connection and rough-in for illuminated rail.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 60 percent of minimum yield strength.
2. Glass: 25 percent of mean modulus of rupture (50 percent probability of breakage), as listed in "Mechanical Properties" in AAMA's Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:
   a. Uniform load of 50 lbf/ft. applied in any direction.
   b. Concentrated load of 200 lbf 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 applied horizontally on an area of 1 sq. ft.
   b. Infill load and other loads need not be assumed to act concurrently.
3. Glass-Supported Railings: Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products the following. Comparable alternate manufacturers offering products that may be incorporated into the Work to be submitted for vetting by Engineer and Architect:

1. Illuminated Decorative Railings (Re: electrical drawings; Illuminaire Schedule Sheet E01):
   a. IO Lighting, Luxrail (basis of design)

2. Decorative Railings (match profile of Illuminated Decorative Railing)
   a. IO Lighting, Luxrail (basis of design)

3. Glass Supported Railings:
   a. Livers Bronze Co, Struct-U-Rail system (basis of design)

B. Satin Stainless Steel finish with 1.66 outside diameter handrail.

2.3 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

1. Provide cast-metal brackets with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide either formed- or cast-metal brackets with predrilled hole for exposed bolt anchorage.
3. Provide formed-steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

2.4 GLASS AND GLAZING MATERIALS

A. Laminated Glass: ASTM C 1172, Condition A (uncoated), Type I (transparent flat glass), Quality-Q3 with two plies of glass and polyvinyl butyral interlayer not less than 0.060 inch thick.

2. Glass Color: Clear.
4. Glass Plies for Structural Glass Balusters: Thickness required by structural loads, but not less than 6.0 mm thick, each.
5. Glass Plies for Glass Infill Panels: Thickness required by structural loads, but not less than 4.0 mm, each.

B. Glazing Cement and Accessories for Structural Glazing: Glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.
   1. Glazing Cement: Nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.

C. Glazing Gaskets for Glass Infill Panels: Glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.5 FASTENERS

A. Fastener Materials: Unless otherwise indicated, provide the following:
   1. Dissimilar Metals: Type 304 stainless-steel fasteners.

B. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated.
   1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.

D. Anchors, General: 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.

E. Post-Installed Anchors: Torque-controlled expansion anchors.
   1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Electrical Components: Provide internal, LED light fixtures and electrical components, required as part of illuminated railings, that comply with NFPA 70 and that are listed and labeled by UL.

2.7 FABRICATION

A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage.

B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with nonwelded connections unless otherwise indicated.

H. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

I. Form changes in direction as follows:
   1. As detailed.

J. 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.

K. Close exposed ends of hollow railing members with prefabricated end fittings.

L. Provide wall returns at ends of wall-mounted handrails as indicated on drawings.

M. 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 to plaster or 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.

N. 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.

2.8 GLAZING PANEL FABRICATION

A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.
   1. Clean-cut or flat-grind edges at butt-glazed sealant joints to produce square edges with slight chamfers at junctions of edges and faces.
   2. Grind smooth exposed edges, including those at open joints, to produce square edges with slight chamfers at junctions of edges and faces.

B. Infill Panels: Provide laminated, heat-strengthened glass panels.

2.9 ILLUMINATED RAILINGS

A. Illuminated Units: Provide internal illumination using concealed, internally wired, LED fixture system to illuminate walking surfaces adjacent to railings without light leaks. Make provisions for servicing and for concealed connection to electric service. Coordinate electrical characteristics with those of the power supply provided.
1. LED: Provide LED required by railing length.
2. Diffusers: UV-stabilized acrylic diffusers matching profile of railings.
3. Drivers: Provide drivers as indicated on electrical drawings.

2.10 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

B. Adjust railings before anchoring to ensure matching alignment at abutting joints.

C. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING RAILINGS

A. Attach handrails to walls with wall brackets except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
B. Secure wall brackets to building construction as follows:
   1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
   2. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.

3.5 INSTALLING GLASS PANELS

A. Glass-Supported Railings: Install assembly to comply with railing manufacturer’s written instructions.
   1. Adjust spacing of glass panels so gaps between panels are equal before securing in position.

B. Post-Supported Glass Railings: Install assembly to comply with railing manufacturer’s written instructions and with requirements in other Part 3 articles. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field. Protect edges from damage.

3.6 CLEANING

A. Clean aluminum and stainless steel by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

B. Clean and polish glass as recommended in writing by manufacturer. Wash both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion.

3.7 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300
SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

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. Framing with dimension lumber.
2. Wood blocking, cants, and nailers.
3. Wood furring.
4. Plywood backing panels.

1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

3. NLGA: National Lumber Grades Authority.
5. WCLIB: West Coast Lumber Inspection Bureau.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
1.5 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Multipurpose Construction Adhesives: 70 g/L.

B. Low-Emitting Materials - Composite Wood and Agrifiber Products: Use composite wood and agrifiber products that contain no added urea-formaldehyde resins on the interior of the building. Laminating adhesives used to fabricate such products shall also not contain added urea-formaldehyde resins.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
   2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
   3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
   4. Wood framing members that are less than 18 inches above the ground in crawl spaces or unexcavated areas.
   5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Use treatment that does not promote corrosion of metal fasteners.
   2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.
   1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

E. Application: Treat all miscellaneous carpentry unless otherwise indicated.
   1. Framing for raised platforms.
   2. Concealed blocking.
   3. Roof framing and blocking.
   4. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
   5. Plywood backing panels.
2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.
   3. Cants.
   4. Furring.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber and any of the following species:
   1. Hem-fir (north); NLGA.
   2. Mixed southern pine; SPIB.
   3. Spruce-pine-fir; NLGA.
   4. Hem-fir; WCLIB or WWPA.
   5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
   6. Western woods; WCLIB or WWPA.
   7. Northern species; NLGA.
   8. Eastern softwoods; NeLMA.

C. For concealed boards, provide lumber with 19 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine, No. 3 grade; SPIB.
   2. Hem-fir or hem-fir (north), Standard or No. 3 Common grade; NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or spruce-pine-fir, Standard or No. 3 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

E. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

F. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

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

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
   1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Metal Framing: ASTM C 1002 or ASTM C 954, length as recommended by screw manufacturer for material being fastened.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

I. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

J. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally at 24 inches.

3.4 PROTECTION

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

B. Protect miscellaneous rough carpentry from weather. If, despite protection, miscellaneous rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053
SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wall sheathing.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for plywood backing panels.

1.3 ACTION SUBMITTALS

A. Product Data:  For each type of process and factory-fabricated product.  Indicate component materials and dimensions and include construction and application details.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content:  Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section.  Document the material cost of each Product.

B. Regional Materials:  Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site.  Document the material cost of each Product.

C. Low-Emitting Materials - Adhesives and Sealants:  Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

1.  Provide quantity take offs for each adhesive.

D. Evaluation Reports:  For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.
3. Foam-plastic sheathing.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives:  Provide the quantity of each interior adhesive used.
1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Subfloor Adhesives: 50 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.


2.2 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:

a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond e(2)XP.
d. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch thick.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.
2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.5 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.
C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.

2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Interior standing and running trim.
   2. Interior frames and jambs.
   3. Stile and rail wood paneling (stile and rail wall and ceiling surfacing).
   4. Wood cabinets.
   5. Plastic-laminate face cabinets.
   7. Wood furring, blocking, shims, and hanging strips for installing woodwork unless concealed within other construction before paneling installation.
   8. Shop finishing of interior woodwork.

B. Related Requirements:
   1. Section 061053 "Miscellaneous Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing woodwork and concealed within other construction before woodwork installation.
   2. Section 079200 "Joint Sealant" for joint sealant at wood trim and countertops.

1.3 ACTION SUBMITTALS

A. Product Data: For high-pressure decorative laminate adhesives solid-surfacing material cabinet hardware and accessories and finishing materials and processes.
   1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for [electrical switches and outlets] [plumbing fixtures] [faucets] [soap dispensers] [and other items] installed in architectural woodwork.
   4. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
   5. Apply WI Certified Compliance Program label to Shop Drawings.
   6. Apply AWI Quality Certification Program label to Shop Drawings.

C. Samples for Initial Selection:
1. Shop-applied transparent finishes.
2. Shop-applied opaque finishes.
4. PVC edge material.
5. Thermoset decorative panels.
7. Quartz agglomerate materials.

D. Samples for Verification:

1. Veneer leaves representative of and selected from flitches to be used for transparent-finished woodwork.
2. Veneer-faced panel products with or for transparent finish, [8 by 10 inches] [12 by 24 inches], for each species and cut. Include at least one face-veneer seam and finish as specified.
3. Lumber [and panel products] with shop-applied opaque finish, 5 inches wide by 12 inches long for lumber [and] [8 by 10 inches] [12 by 12 inches] [for panels], for each finish system and color, with[ one-half of] exposed surface finished.
4. Plastic laminates, [8 by 10 inches] [12 by 12 inches], for each type, color, pattern, and surface finish[, with one sample applied to core material] [and specified edge material applied to one edge].
5. Thermoset decorative panels, [8 by 10 inches] [12 by 12 inches], for each color, pattern, and surface finish[ with edge banding on one edge].
7. Quartz agglomerate materials, 6 inches square.
8. Corner pieces as follows:
   a. Joints between stiles and rails, as well as exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
   b. Miter joints for standing trim.
9. Exposed cabinet hardware and accessories, one unit for each type[ and finish].

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and Fabricator.

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was manufactured within 500 miles of the project site. Document the material cost of each Product.

1. <Insert Local/Regional Material>.

D. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

E. Rapidly Renewable Materials: Manufacturer's documentation declaring type and percentage of rapidly renewable materials contained in each product. Document the material cost of each rapidly renewable component.

F. Certified Wood: For certified wood and wood products provide documentation of certified status of forest. Documentation to contain supplier's Chain of Custody number, identify each certified product, and manufacturer on a line item basis. Provide percentage and cost of each certified wood component. Submit vendor's invoice for certified wood and wood products.
G. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer’s printed statement of VOC content in g/l for each interior adhesive.
   1. Provide quantity take offs for each adhesive.

H. Low-Emitting Materials - Composite Wood and Agrifiber Products: Manufacturer’s certificate for each composite wood or agrifiber and adhesive indicating no added urea-formaldehyde resin.

I. Product Certificates: For each type of product.
   1. Composite wood and agrifiber products.
   2. Thermoset decorative panels.
   3. High-pressure decorative laminate.
   4. Adhesives.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Certified Wood: Provide wood and wood products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, “Principles and Criteria.”

D. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Wood Adhesives: 30 g/L.
   2. Multipurpose Construction Adhesives: 70 g/L.
   3. Contact Adhesive: 80 g/L.
   4. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inches or less in thickness to any surface): 250 g/L.

E. Low-Emitting Materials - Composite Wood and Agrifiber Products: Use composite wood and agrifiber products that contain no added urea-formaldehyde resins on the interior of the building. Laminating adhesives used to fabricate such products shall also not contain added urea-formaldehyde resins.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in “Field Conditions” Article.
1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

C. Established Dimensions: Where woodwork are indicated to fit to other construction, establish dimensions for areas where woodwork are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers wood paneling, base, wood doors and frames with face veneers that are sequence matched with woodwork and transparent-finished wood doors that are required to be of same species as woodwork.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR TRANSPARENT FINISH

A. Grade: Premium.

B. For trim items other than base wider than available lumber, use veneered construction. Do not glue for width.

1. For veneered base, use hardwood lumber core, glued for width.

C. For base wider than available lumber, glue for width. Do not use veneered construction.

2.3 INTERIOR FRAMES AND JAMBS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. For frames or jambs wider than available lumber, use veneered construction. Do not glue for width.

2.4 STILE AND RAIL WOOD PANELING FOR TRANSPARENT FINISH

A. Grade: Premium.
2.5 WOOD CABINETS FOR TRANSPARENT FINISH

A. Grade: Premium.

B. Type of Construction: Frameless.

C. Cabinet and Door and Drawer Front Interface Style: Flush overlay.

D. Reveal Dimension: 1/2 inches.

E. Wood for Exposed Surfaces: White Oak

1. Grain Direction: Vertically for drawer fronts, doors, and fixed panels.
3. Veneer Matching within Panel Face: Center-balance match.
4. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.

F. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: Compatible species to that indicated for exposed surfaces, stained to match.
2. Drawer Subfronts, Backs, and Sides: Solid-hardwood lumber, stained to match species indicated for exposed surfaces.
3. Drawer Bottoms: Hardwood plywood.

G. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.

1. Join subfronts, backs, and sides with glued dovetail joints.

2.6 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Grade: Premium.
B. Type of Construction: Frameless.

C. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.

D. Reveal Dimension: 1/2 inches.

E. Laminate Cladding for Exposed Surfaces:
   1. Horizontal Surfaces: Grade HGL.
   2. Vertical Surfaces: Grade VGS.
   3. Edges: PVC or polyester edge banding, 0.12 inches thick, matching laminate in color, pattern, and finish.

F. Materials for Semiexposed Surfaces:
   1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
      a. Edges of Plastic-Laminate Shelves: PVC or polyester edge banding, 0.12 inches thick, matching laminate in color, pattern, and finish.
      b. For semiexposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, NEMA LD 3, Grade VGS.
   2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
   3. Drawer Bottoms: Thermoset decorative panels.

G. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, NEMA LD 3, Grade BKL.

H. Drawer Construction: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
   1. Join subfronts, backs, and sides with glued dovetail joints.

2.7 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Grade: Premium.

B. Configuration: Provide countertops with the following front and backsplash style:
   1. Front: Straight, slightly eased at top.
   2. Backsplash: Straight, slightly eased at corner.

C. Countertops: 3/4 inch thick, solid surface material with front edge built up with same material.

D. Backsplashes: 1/2 inch thick, solid surface material.

E. Subtop Material: Particleboard or medium-density fiberboard.

F. Subtop Material at Sinks: Exterior-grade plywood.

G. Core Thickness: 3/4 inch.
   1. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of core material laminated to top.
H. Fabrication: Fabricate tops in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

1. Fabricate with loose backsplashes for field assembly.
2. Install integral sink bowls in countertops in the shop.

2.8 MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
2. Wood Moisture Content: 5 to 10 percent.

B. Wood for Transparent Finish:

   b. Source Limitations: Obtain veneer from single manufacturer.

C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

2. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

D. High-Pressure Decorative Laminate [PL1]: NEMA LD 3.
   a. Basis-of-Design Product: The design for plastic laminate is based on Rehau Rauvisio, Brilliant Blano with laser edge banding and white melamine interiors.

E. Solid Surface Material [SS1]: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: The design for solid surface is based on Wilsonart. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   a. Avonite Surfaces.
   b. Formica Corporation.
   c. Wilsonart International.

3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

2.9 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087100 "Door Hardware.”

B. Butt Hinges: 2-3/4 inch, five-knuckle steel hinges made from 0.095 inch thick metal, and as follows:

1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.

C. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 170 degrees of opening, self-closing.

D. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

E. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112.

F. Drawer Slides: BHMA A156.9.
   1. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated-steel ball-bearing slides.
   2. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
   3. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
   4. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-200.
   5. For computer keyboard shelves, provide Grade 1HD-100.

G. Door Locks: BHMA A156.11, E07121.

H. Door and Drawer Silencers: BHMA A156.16, L03011.

I. Grommets for Cable Passage through Countertops: 2 inch OD, as selected by Architect from manufacturer's full range of colors, molded-plastic grommets and matching plastic caps with slot for wire passage.
   1. Product: Subject to compliance with requirements, provide "OG series" by Doug Mockett & Company, Inc.

J. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
   1. Satin Stainless Steel: BHMA 630.

K. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.10 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Z-Clip: Interlocking aluminum extrusion.
   1. For wood paneling at soffits use Star Hanger Systems ceiling clips, SKU 510 Z-Clips.

C. Provide self-drilling screws for metal-framing supports, as recommended by metal-framing manufacturer.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.

E. Adhesives: Do not use adhesives that contain urea formaldehyde.

F. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.
2.11 FABRICATION

A. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners and Edges of Solid-wood (Lumber) Member: 1/16 inch unless otherwise indicated.

B. Arrange paneling in shop or other suitable space in proposed sequence for examination by Architect. Mark units with temporary sequence numbers to indicate position in proposed layout.

C. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on approved Shop Drawings before disassembling for shipment.

D. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.12 SHOP FINISHING

A. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

B. Shop Priming: Shop apply the prime coat including backpriming, if any, for transparent-finished items specified to be field finished. Refer to [Section 099123 "Interior Painting"] and [Section 099300 "Staining and Transparent Finishing"] for material and application requirements.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative panels. Apply two coats to surfaces installed in contact with concrete or masonry and to end-grain surfaces.

D. Transparent Finish:

1. Grade: Premium.
2. Finish: System - 12, water-based polyurethane.
3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
4. Staining: None required.
5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

B. Before installing cabinets, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with same grade as item to be installed.

B. Assemble woodwork and complete fabrication at Project site to the extent that it was not completed in the shop.
   1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items.
   2. Seal edges of cutouts in countertop subtops by saturating with varnish.

C. Install woodwork level, plumb, true, and straight with no distortions. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96 inches vertical cup or bow and 1/8 inch in 96 inches horizontal variation from a true plane.
   1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

D. Scribe and cut cabinets and countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork.
   1. For shop finished items use filler matching finish of items being installed.

F. Paneling: Anchor to supporting substrate with concealed panel-hanger clips. Do not use face fastening unless otherwise indicated.
   1. Install with no more than 1/16 inch in 96 inches vertical cup or bow and 1/8 inch in 96 inches horizontal variation from a true plane.
   2. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

G. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96 inches sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.
   3. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2 inch penetration into wood framing, blocking, or hanging strips.
H. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with latex sealant, painted to match wall.
2. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer’s written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

1. Install countertops with no more than 1/8 inch in 96 inch sag, bow, or other variation from a straight line.
2. Install backsplashes and endsplashes to comply with manufacturer’s written instructions for adhesives, sealers, fabrication, and finishing.
3. Seal edges of cutouts in particleboard subtops by saturating with varnish.
4. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

J. Complete finishing work specified in this Section to extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed.

1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are applied in shop.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.
SECTION 071326 - 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. Bonded HDPE or polyethylene sheet waterproofing for under slab waterproofing.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for coordination of concrete installations with waterproofing and water stop systems.
2. Section 071416 "Cold Fluid-Applied Waterproofing" for below grade foundation waterproofing systems.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to waterproofing systems including but not limited to, the following:

1. Meet with Owner, Architect, testing and inspecting agency representative, waterproofing Installer, waterproofing system manufacturer's technical representative, and installers whose work interfaces with or affects waterproofing installations including soil and planting placement.
2. Review methods and procedures related to waterproofing installation, including manufacturer's written instructions. Review waterproofing contractor's application procedures for fluid applied waterproofing.
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. Review existing substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer/installer.
5. Review base flashings, special flashing details, drainage, penetrations and condition of other construction that affects waterproofing system.
6. Review temporary protection requirements for waterproofing during and after installation.
7. Review waterproofing observation and repair procedures after waterproofing installation.
8. Review field quality control and testing requirements.

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 of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
   3. Submit only project specific details that have been reviewed and approved by the membrane manufacturer. Manufacturer's standard details are not acceptable.
   4. Shop drawing shall be signed by authorized representative of membrane manufacturer stating that submittal details conform to manufacturer's warranty requirements for this specific Project.

C. Samples: For each product specified, including the following products:
   1. 12-by-12-inch square of waterproofing and flashing sheet.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:
   1. For Installer: In addition to experience qualification information provide a list of projects of similar nature by installer which have been installed during last five (5) years.
   2. For Testing agency: In addition to experience qualification information provide a list of projects of similar nature by testing agency which have been installed during last five (5) years.

B. Manufacturer Certificates:
   1. Submit letter indicating that manufacturer has reviewed project documents and will issue the specified warranty upon successful completion of the installation.
   2. Submit manufacturer's current approval of installer and date of initial certification.
   3. Product Certificates: From waterproofing manufacturer, certifying compatibility of waterproofing and accessory materials with Project materials that connect to or that come in contact with the waterproofing systems.

C. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

D. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
   1. Self-adhering sheet roofing.

E. Field quality-control reports.
   1. Submit reports to Owner and Architect within five (5) working days of site visit.

F. Sample Warranties: Copies of Waterproofing Manufacturer's special warranty, Waterproofing Installer's warranty, stating obligations, remedies, limitations, and exclusions.

G. Minutes of preinstallation conference.

1.6 CLOSEOUT SUBMITTALS

A. Inspection Report: Copy of waterproofing system manufacturer's inspection report of completed waterproofing installation.
1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer with ten (10) years of cold fluid applied waterproofing manufacturing experience for membrane waterproofing system of the types specified for this Project.
2. Minimum ten (10) years previous successful experience in installations of similar systems.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer; that is eligible to receive manufacturer’s special warranty; having at least five (5) years experience installing waterproofing systems identical to that used for this Project and has successfully completed a minimum of five (5) previous projects of similar in system and nature and of equal or greater size to this Project in the last year.

C. During installations and upon completion of installation, a technical representative of the manufacturer shall conduct inspections to certify that waterproofing system has been installed according to the manufacturer’s most current published specifications, details and approved shop drawings.

D. Obtain written approval from the manufacturer for any materials not manufactured or provided by manufacturer stating that materials are acceptable and are compatible with other materials and systems required.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver waterproofing 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. Labels must be intact and legible.

B. Provide continuous protection of materials against deterioration:

1. Store materials in accordance with manufacturer’s recommendations. Store rolled goods up on roll ends on clean raised platforms. Store other materials in dry area, protected from water and direct sunlight, and maintain at a temperatures recommended by waterproofing manufacturer.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate.
2. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.10 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and penetration assemblies with the manufacturers and installers of other waterproofing assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

B. Provide documentation of curing time durations for installed concrete to contact systems installed under this section and confirm compliance with manufacturers waterproofing manufacturer’s requirements.
1.11 WARRANTY

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

1. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Installer's Special Warranty: Signed by Installer, covering Work of this Section, for warranty period of two (2) years.

1. Warranty is to include for work installed under this specification section: That during Warranty Period the installer will, at installer's 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Waterproofing materials shall be compatible with one another and adjacent materials and substrates under conditions of service and application required, as demonstrated by waterproofing manufacturer based on testing and field experience.

2.3 BONDED HDPE OR POLYETHYLENE SHEET WATERPROOFING

A. Basis-of-Design Product Horizontal Applications: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co.--Conn.; Preprufe 300R or a comparable product by one of the following:

1. Approved equals.

B. Bonded HDPE or Polyethylene Sheet for Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil thickness, or a cross-laminated film of low- and medium-density polyethylene, coated with a modified asphalt layer and a nonwoven geotextile-fabric final layer, total 95-mil thickness; with the following physical properties:

1. Tensile Strength, Film: 2000 psi minimum; ASTM D 412.
3. Peel Adhesion to Concrete: 5 lbf/in. minimum; ASTM D 903, modified.
4. Lap Adhesion: 2.5 lbf/in. minimum; ASTM D 1876, modified.
7. Water Vapor Permeance: 0.01 perms maximum; ASTM E 96/E 96M, Water Method.
8. Water Absorption: 0.5 percent maximum; ASTM D 570.
2.4 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Waterstop: Basis of Design: Refer to Section 033000 "Cast-in-Place Concrete" for coordination of waterstops cast into concrete foundation systems. Coordinate waterstop requirements with waterproofing manufacturer's warranty requirements.

E. Metal Termination Bars: Provide Manufacturer's, predrilled, type 316 stainless-steel termination bars, approximately 25mm wide by 3 mm 1/8 inch thick and 1 inch tall; with stainless-steel anchors. Pre-drill fastener holes at 6 inches on-center with stainless steel fasteners of the same material.

F. 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: 1/4 inch, nominal.
   2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

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 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 and accepted in writing by the installer.
   1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

3.3 BONDED HDPE OR POLYETHYLENE SHEET-WATERPROOFING APPLICATION

A. Install bonded HDPE or polyethylene sheets according to manufacturer's written instructions.
B. Horizontal Applications: Install sheet with HDPE or polyethylene 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.

1. Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions. Concrete substrates shall be smooth or broom finished and monolithic. Fill gaps or voids greater than 13 mm (0.5 in.). Remove standing water prior to membrane applications.

C. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.

D. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.

E. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.

F. Install termination bars as required by manufacturer and at locations indicated on the drawings.

G. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Contractor is to engage the waterproofing membrane Manufacturer's site representative to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and to furnish inspection reports to Owner's Representative and Architect.

1. Inspect the substrate conditions prior to the first installation and prior to placement of concrete over waterproofing.
2. Final Waterproofing Inspection: Arrange for waterproofing system manufacturer's technical personnel to inspect waterproofing installation on completion.
3. Submit written reports within five (5) working days of site visit.

B. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection and to furnish written reports to Owner and Architect within five (5) working days of each site visit.

1. Contractor is to coordinate with and notify owner's testing and inspection agency a minimum of 72 hours in advance of required inspections.

C. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.

D. Waterproofing system will be considered defective if it does not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

E. Prepare test and inspection reports.

1. Submit reports to Owner and Architect within five (5) working days of site visit.
3.5 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing from damage and wear during remainder of construction period.

B. Protect installed 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.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326
SECTION 071416 - 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. Latex-rubber waterproofing.

B. Related Requirements:

1. Section 033000 “Cast-in-Place Concrete” for coordination of concrete installations with waterproofing and water stop systems and curing of substrates prior to installation.
3. Section 071326 “Self-Adhering Sheet Waterproofing” for below slab waterproofing systems.
4. Section 334613 “Foundation Drainage” for building perimeter drainage system.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to waterproofing systems including but not limited to, the following:

1. Meet with Owner, Architect, testing and inspecting agency representative, waterproofing Installer, waterproofing system manufacturer's technical representative, and installers whose work interfaces with or affects waterproofing installations including soil and planting placement.
2. Review methods and procedures related to waterproofing installation, including manufacturer's written instructions. Review waterproofing contractor's application procedures for fluid applied waterproofing.
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. Review existing substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer/installer.
5. Review base flashings, special flashing details, drainage, penetrations and condition of other construction that affects waterproofing system.
6. Review temporary protection requirements for waterproofing during and after installation.
7. Review waterproofing observation and repair procedures after waterproofing installation.
8. Review field quality control and testing requirements.

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. Submit only project specific details that have been reviewed and approved by the membrane manufacturer. Manufacturer's standard details are not acceptable.
4. Shop drawing shall be signed by authorized representative of membrane manufacturer stating that submittal details conform to manufacturer's warranty requirements for this specific Project.

C. Samples: For each product specified, including the following products:

1. 12 by 12 inches square of waterproofing and flashing sheet.
2. 12 by 12 inches square of insulation.
3. 12 by 12 inches square of drainage panel.
4. Termination bar 12 inches in length.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Manufacturer: In addition to experience qualification information provide a list of projects of similar nature by manufacturer which have been installed during last five (5) years.
2. For Installer: In addition to experience qualification information provide a list of projects of similar nature by installer which have been installed during last five (5) years.
3. For Testing agency: In addition to experience qualification information provide a list of projects of similar nature by testing agency which have been installed during last five (5) years.

B. Manufacturer Certificates:

1. Submit letter indicating that manufacturer has reviewed project documents and will issue the specified warranty upon successful completion of the installation.
2. Submit manufacturer's current approval of installer and date of initial certification.
3. Product Certificates: From waterproofing manufacturer, certifying compatibility of waterproofing and accessory materials with Project materials that connect to or that come in contact with the waterproofing systems.

C. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

D. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

E. Minutes of preinstallation conference.

F. Field quality-control reports.

1. Submit reports to Owner and Architect within five (5) working days of each site visit.

G. Sample Warranties: Copies of Waterproofing Manufacturer’s special warranty, Waterproofing Installer's warranty, stating obligations, remedies, limitations, and exclusions.
1.6 CLOSEOUT SUBMITTALS

A. Inspection Report: Copy of waterproofing system manufacturer's periodic inspection reports of completed waterproofing installation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer with ten (10) years of cold fluid applied waterproofing manufacturing experience for membrane waterproofing system of the types specified for this Project.

2. Minimum ten (10) years previous successful experience in installations of similar systems.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer; that is eligible to receive manufacturer's special warranty; having at least five (5) years experience installing waterproofing systems identical to that used for this Project and has successfully completed a minimum of five (5) previous projects of similar in system and nature and of equal or greater size to this Project in the last year.

C. During installations and upon completion of installation, a technical representative of the manufacturer shall conduct inspections to certify that waterproofing system has been installed according to the manufacturer's most current published specifications, details and approved shop drawings.

1. Coordinate with requirements under the Field Quality Control section of this specification.

D. Obtain written approval from the manufacturer for any materials not manufactured or provided by manufacturer stating that materials are acceptable and are compatible with other materials and systems required.

E. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. All materials and submittals materials that constitute the mockup must be submitted and approved prior to mockup construction.

2. Build free standing integrated mockup of the exterior wall assembly at the location shown on Drawings or if not shown at a location directed by the Architect, incorporating foundation wall assemblies, precast wall assemblies, curtainwall and glazing assemblies, flashings, closures, trim and sealants.

   a. Include typical components, attachments to building structure, and methods of installation.

3. Prepare mockup for inspection and testing requirements: Mockups are to be reviewed and tested in phases or stages of completion. For example: precast cladding installation and joint sealing is to be reviewed prior to installation of curtainwall and glazing assemblies and joint sealants. Coordinate phasing for each mockup type with Architect and Owner.

   a. Test mock for membrane adhesion and installation thickness.

4. 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. Deliver waterproofing 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. Labels must be intact and legible.

B. Provide continuous protection of materials against deterioration:
   1. Store materials in accordance with manufacturer’s recommendations. Store rolled goods up on roll ends on clean raised platforms. Store other materials in dry area, protected from water and direct sunlight, and maintain at a temperatures recommended by waterproofing manufacturer.

1.9 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 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.

1.10 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and penetration assemblies with the manufacturers and installers of other waterproofing and enclosure assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

B. Provide documentation of curing time durations for installed concrete to contact systems installed under this section and confirm compliance with manufacturers waterproofing manufacturer’s requirements.

1.11 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace waterproofing that does not comply with requirements or and that fails in materials or workmanship within specified warranty period.
   1. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Installer’s Special Warranty: Signed by Installer, covering Work of this Section, for warranty period of two (2) years.
   1. Warranty includes removing and reinstalling but not limited to the following: Pavement, landscaping, earth backfill, drainage panels, insulation and foundation drainage systems.
PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
   A. Source Limitations for Waterproofing System: Obtain waterproofing materials and molded-sheet drainage panels from single source from single manufacturer.

2.2 LATEX-RUBBER WATERPROOFING
      1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn; “Procor” or a comparable product by one of the following:
         a. Polywall; Commercial Stretch.
         b. Approved equals.

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 acrylic latex, polyurethane, or epoxy.
   C. Joint Reinforcing Strip: Manufacturer’s recommended fiberglass mesh or polyester fabric.
   D. Waterstop Basis of Design: Refer to Section 033000 “Cast-in-Place Concrete” for coordination of waterstops cast into concrete foundation systems. Coordinate waterstop requirements with waterproofing manufacturer’s warranty requirements.
   E. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C 920, 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.
   F. Metal Termination Bars: Manufacturer provided, predrilled, type 316 stainless-steel termination bars, approximately 25mm wide by 3 mm 1/8 inch thick and 1 inch tall; with stainless-steel anchors. Pre-drill fastener holes at 6 inches on-center with stainless steel fasteners of the same material.

2.4 MOLDED-SHEET DRAINAGE PANELS
   A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft..
      1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn; Hydroduct 220 or a comparable product by one of the following:
a. Approved equals by waterproofing membrane manufacturer.

B. Coordinate with Section 334613 “Foundation Drainage.”

2.5 INSULATION

A. Board Insulation: Extruded-polystyrene board insulation according to ASTM C 578, square edged.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.

2. Type VI, 40-psi minimum compressive strength.

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 in writing 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

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. Close off deck drains and all other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. 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 D 4259 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 D 4258.
E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

F. Grind irregular construction joints to suitable flush surface.

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 C 1471.

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 C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

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 wide along each side of joint. Apply waterproofing in two separate applications and embed a joint reinforcing strip in the first preparation coat.

B. Install sheet flashing and bond to deck and wall substrates where required according to waterproofing manufacturer's written instructions.

1. Extend sheet flashings for 4 inches but not less than required by system manufacturer onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 1471.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

D. 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 or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a dry film thickness of 60 mils and 120 mil in detail areas.
2. Apply waterproofing to prepared wall terminations, vertical and horizontal surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 600 sq. ft.
4. Follow manufacturer's installation requirements for installation in direct sunlight.

E. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

F. Install termination bars as required by manufacturer and at locations indicated on the drawings.
3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install board insulation before installing drainage panels.
2. Mechanically terminate and close drainage panel to back up wall at top of installation with continuous termination bar.

3.7 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions.

C. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish written reports to Owner and Architect within five (5) working days of each site visit.

1. Contractor is to coordinate with and notify owner's testing and inspection agency a minimum of 72 hours in advance of required inspections.
2. Adhesion Testing: Waterproofing assemblies are to be tested for minimum adhesion requirements, "values as required by the primary membrane manufacturer for the applicable substrate" for each 56 sq. meters 600 sq. ft of installed waterproofing or part thereof.
3. Testing agency shall verify thickness of waterproofing during application for each 600 sq. ft. of installed waterproofing or part thereof.

B. Manufacturer's Field Service: Contractor is to engage the waterproofing membrane Manufacturer's site representative to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish reports to Owner's Representative and Architect.

1. Inspect the substrate conditions prior to the first installation.
2. Inspect installations at a minimum of 25, 50 and 90 percent completion.
3. Final Waterproofing Inspection: Arrange for waterproofing system manufacturer's technical personnel to inspect waterproofing installation on completion.
4. Submit written reports within five (5) working days of each site visit.

C. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.

D. Waterproofing system will be considered defective if it does not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
3.9 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 board insulation 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 071416
SECTION 071418 - COLD FLUID-APPLIED WATERPROOFING DECK SYSTEM

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. Polyurea waterproofing.
   2. Prefabricated drainage composite
   3. Insulation
   4. Top coat for waterproofing.

B. Related Requirements:
   1. Section 033000 “Cast-in-Place Concrete” for coordination of waterstops cast into concrete foundation systems and curing of substrates prior to installation.
   2. Section 071416 “Cold Fluid-Applied Waterproofing” for below grade foundation waterproofing systems.
   3. Section 071326 “Self-Adhering Sheet Waterproofing” for below slab waterproofing systems.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to waterproofing systems including but not limited to, the following:
   1. Meet with Owner, Architect, testing and inspecting agency representative, waterproofing Installer, waterproofing system manufacturer's technical representative, and installers whose work interfaces with or affects waterproofing installations including soil and planting placement.
   2. Review methods and procedures related to waterproofing installation, including manufacturer's written instructions. Review waterproofing contractor's application procedures for fluid applied waterproofing.
   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. Review existing substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer/installer.
   5. Review base flashings, special flashing details, drainage, penetrations and condition of other construction that affects waterproofing system.
   6. Review temporary protection requirements for waterproofing during and after installation.
   7. Review waterproofing observation and repair procedures after waterproofing installation.
   8. Review field quality control and testing requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
PROJECT MANUAL FOR:
CP170621 - SCHOOL OF MUSIC NEW BUILDING
CP172801 - GENERAL SITE: SCHOOL OF MUSIC EXTENDED UTILITIES

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. Submit only project specific details that have been reviewed and approved by the membrane manufacturer. Manufacturer's standard details are not acceptable.
4. Shop drawing shall be signed by authorized representative of membrane manufacturer stating that submittal details conform to manufacturer's warranty requirements for this specific Project.
5. 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. 12 by 12 inches square of waterproofing and flashing sheet.
2. 12 by 12 inches square of insulation.
3. 12 by 12 inches square of drainage panel.
4. Termination bar 12 inches in length.
5. Plaza-deck paver, 8 by 8 inches. square, in each color and texture required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:
1. For Manufacturer: In addition to experience qualification information provide a list of projects of similar nature by manufacturer which have been installed during last five (5) years.
2. For Installer: In addition to experience qualification information provide a list of projects of similar nature by installer which have been installed during last five (5) years.
3. For Testing agency: In addition to experience qualification information provide a list of projects of similar nature by testing agency which have been installed during last five (5) years.

B. Manufacturer Certificates:
1. Submit Division1 document "1.E.2 University of Missouri Roof System Manufacturers Certification" indicating that manufacturer has reviewed project documents, materials/systems will meet or exceed the specifications and will issue the specified warranty upon successful completion of the installation.
2. Submit manufacturer's current approval of installer and date of initial certification.
3. Product Certificates: From waterproofing manufacturer, certifying compatibility of waterproofing and accessory materials with Project materials that connect to or that come in contact with the waterproofing. Provide documentation of compatibility and adhesion with waterproofing and waterproofing membranes.

C. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

D. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

E. Minutes of preinstallation conference.
F. Field quality-control reports.
   1. Submit reports to Owner and Architect within five (5) working days of each site visit.

G. Sample Warranties: Copies of Waterproofing Manufacturer's special warranty, Waterproofing Installer's warranty, stating obligations, remedies, limitations, and exclusions.
   1. Refer to requirements in Division 1 documents 1.E.2 University of Missouri Roof System Manufacturers Certification and 1.E.3 University of Missouri Contractors Roofing/Flashing/Sheet Metal Guarantee.

1.6 CLOSEOUT SUBMITTALS

A. Inspection Report: Copy of waterproofing system manufacturer's progress inspection reports and final report of completed waterproofing installation.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. A qualified manufacturer with ten (10) years of cold fluid applied waterproofing manufacturing experience for membrane waterproofing system of the types specified for this Project.
   2. Minimum ten (10) years previous successful experience in installations of similar systems.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer; that is eligible to receive manufacturer's special warranty; having at least five (5) years experience installing waterproofing systems identical to that used for this Project and has successfully completed a minimum of five previous projects of similar in system and nature and of equal or greater size to this Project in the last year.

C. Upon completion of waterproofing installation and prior to installation of the drainage course, a technical representative of the manufacturer shall conduct an inspection to certify that waterproofing system has been installed according to the manufacturer's most current published specifications, details and approved shop drawings. Manufacturer's field technical representative is to provide a written report to Owner and Architect within five (5) working days of each site visit.
   1. See additional requirements under the Field Quality Control article of this specification section.

D. Obtain written approval from the manufacturer for any materials not manufactured or provided by manufacturer stating that materials are acceptable and are compatible with other materials and systems required.

E. 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 pavers and accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, and protection.
      a. Size: 100 sq. ft. in area.
      b. Description: Each type of wall and 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. 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 waterproofing 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. Labels must be intact and legible.

B. Provide continuous protection of materials against deterioration:

1. Store materials in accordance with manufacturer’s recommendations. Store rolled goods up on roll ends on clean raised platforms. Store other materials in dry area, protected from water and direct sunlight, and maintain at a temperatures recommended by waterproofing manufacturer.

1.9 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 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.

1.10 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and penetration assemblies with the manufacturers and installers of other enclosure assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

B. Provide documentation of curing time durations for installed concrete to contact systems installed under this section and confirm compliance with manufacturers waterproofing manufacturer’s requirements.

1.11 WARRANTY

A. Manufacturer’s Special Warranty: Manufacturer agrees to repair or replace waterproofing that does not comply with requirements or and that fails in materials or workmanship within specified warranty period.

B. Special warranty includes membrane waterproofing, membrane flashings, roof insulation, fasteners, drainage boards,and other components of membrane roofing system.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Special Project Warranty: Installer is to submit the fully executed “University of Missouri Contractors Roofing/Flashing/Sheet Metal Guarantee” on the form attached in Division 1, signed by Installer, covering the Work of this Section, including all components of membrane waterproofing system such as membrane waterproofing, flashings, insulation, fasteners drainage course for the following warranty period:

1. Warranty Period: Three (3) years from date of Substantial Completion.
2. Warranty includes removing and reinstalling , drainage panels, insulation, pedestals, and pavers on plaza decks.
PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials and molded-sheet drainage panels from single source from single manufacturer.

2.2 TWO-COMPONENT SELF-CURING POLYUREA WATERPROOFING

A. Two-Component, Self-curing, Pure Polyurea Waterproofing: ASTM C 836/C 836M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn; Silcor 900HA fluid applied membrane or a comparable product by one of the following:

   a. HENRY Company, TQ3.
   b. Approved Equals.

2.3 SLIP RESISTANT TOP COAT SYSTEM FOR WATERPROOFING MEMBRANE

A. Two-component, aliphatic urethane based top coat at locations indicated on drawings.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn; Silcor Top Coat 70 fluid applied membrane coating or a comparable product by one of the following:

   a. HENRY Company

2. Slip resistant aggregate: Manufacturers White quartz sand.

   a. Broadcast application per manufacturers requirements.

2.4 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. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; ASTM C 920, Type M, Class 25 or greater; Grade NS for sloping and vertical applications and Grade P for deck applications; Use NT exposure and as specified in Section 079200 “Joint Sealants”; and as recommended by manufacturer for substrate and joint conditions.

1. Backer Rod: Closed-cell polyethylene foam.
2.5 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 18 gpm per ft.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Grace Construction Products; W.R. Grace & Co. -- Conn; Hydroduct 660 or a comparable product by one of the following:
   a. HENRY Company.
   b. Approved Equals by waterproofing membrane manufacturer.

2.6 INSULATION

A. Board Insulation: Extruded-polystyrene board insulation according to ASTM C 578, square edged.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.

2. Type VII, 60-psi minimum compressive strength.

2.7 Filter Fabric Sheet, non-woven, water permeable polymeric fabric:

A. As supplied or recommended by membrane manufacturer for membrane system.

1. Unit Weight: 3.0 oz/sq yd, ASTM C3775
2. Apparent Opening Size: 50 (U.E. sieve)
3. Flow Rate: 150 gpm/ft², ASTMD4491

2.8 PLAZA-DECK PAVERS

A. Concrete Plaza-Deck Pavers: Solid, flat, custom precast concrete pavers by precast architectural concrete panel manufacturer specified in section 034500.

1. Minimum compressive strength: 5000 psi (52 MPa).
2. Thickness: 2 inches.
3. Face Size: 24 inches square.
4. Color and texture: Match architectural precast wall cladding panels in color and abrasive blast finish..

B. Paver Pedestals: Paver-support assembly, manufacturer’ standard SBR rubber high-density polyethylene, or polyurethane, including fixed-height pedestals with spacer tabs for joint spacing of 1/8 inch to 3/16 inch. Provide leveling shims of the same material.

1. Pedestal: Basis of design: Hanover High Tab pedestal 5/8 inch thick and shims.
2.9 INSTALLATION OF SLIP RESISTANT TOP COAT SYSTEM FOR WATERPROOFING MEMBRANE

A. Install coating and slip resistant aggregate per manufacturer's written instructions.
   1. Refer to drawings for locations.

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 in writing 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.

B. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.
   1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

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. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. 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 D 4259 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 D 4258.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

F. Grind irregular construction joints to suitable flush surface.

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 C 1471.
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 C 1471. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.


B. Install sheet flashing and bond to deck and wall substrates where required according to waterproofing manufacturer's written instructions.

1. Extend sheet flashings for 4 inches but not less than required by system manufacturer onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to manufacturer's written instructions and to recommendations in ASTM C 1471.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

D. 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 or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a wet film thickness of 80 mils.
2. Apply two coats of waterproofing at a total minimum thickness of 80 mils to prepared vertical wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 600 sq. ft.
4. Follow manufacturer's installation requirements for installation in direct sunlight.

E. Reinforced Waterproofing Applications: Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other suitable application method.

F. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

G. Install termination bars at locations as required by manufacturer and at locations indicated on the drawings.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
3.7 INSULATION INSTALLATION

A. Install one or more layers of board insulation to achieve required thickness over waterproofed surfaces. Cut and fit to within 3/4 inch of projections and penetrations.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.8 FILTER FABRIC INSTALLATION:

A. Once the drainage course and insulation have been placed over the entire area, install a single ply of the specified filter fabric overlapping edges and ends at least 12 inches over the proceeding sheet. Do not lap ends of fabric sheets within 72 inches of roof perimeter.

B. Extend the fabric 2-inches to 3-inches over the end of the insulation board at penetrations and the perimeters. Do not cover drains or restrict water flow to drains.

C. Back Wrap ends of insulation board at perimeter edge conditions, risewalls, and penetrations. Extend loose edge of fabric12-inches under edge of insulation board.

D. Fabric should be extended up to the base of the scuppers and drains, but should not cover the scupper/drain or in any way restrict the flow of water.

3.9 PLAZA-DECK PAVER INSTALLATION

A. Install pavers according to manufacturer's written instructions.

B. Install fixed -height paver pedestals, shim to elevations required. Adjust for final level and slope of paved surface.

C. Loosely lay pavers on pedestals, maintaining a uniform open joint width. Tightly seat pavers against spacers to eliminate lateral movement or drift of paving assembly. Align joint patterns parallel in each direction.

1. Lay out pavers to avoid less-than-half-width pavers at perimeter or other terminations.

D. Install pavers to vary no more than 1/16 inch in elevation between adjacent pavers and no more than 1/16 inch from surface plane elevation of individual paver.

E. Maintain tolerances of paving installation within 1/4 inch in 10 feet of surface plane in any direction.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish written reports to Owner and Architect within five (5) days of each site visit.

1. Contractor is to coordinate with and notify owner's testing and inspection agency a minimum of 72 hours in advance of required inspections.

2. Adhesion Testing: Protected membrane roofing assemblies are to be tested for minimum adhesion requirements, "values as required by the primary membrane manufacturer for the applicable substrate" for each 56 sq. meters 600 sq.ft of installed waterproofing or part thereof.

3. Testing agency shall verify thickness of waterproofing during application for each 600 sq. ft. of installed waterproofing or part thereof.
B. Manufacturer's Field Service: Contractor is to engage a the waterproofing membrane Manufacturer's to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish reports to Owner's Representative and Architect.

1. Inspect the substrate conditions prior to the first installation.
2. Final Waterproofing Inspection: Arrange for waterproofing system manufacturer's technical personnel to inspect waterproofing installation on completion and prior to installation of drainage course.
3. Submit written reports within five (5) working days of each site visit.

C. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.

D. Waterproofing system will be considered defective if it does not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTION

A. Do not permit foot traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed board insulation 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 071416
SECTION 072100 - 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. Foam-plastic board insulation.
4. Spray-applied cellulose insulation.
5. Spray polyurethane foam insulation.

B. Related Sections:

1. Section 071416 "Cold Fluid- Applied Waterproofing" for insulation installed with waterproofing.
3. Section 075419 Polyvinyl-Chloride (PVC) Roofing for insulation specified as part of roofing construction.
4. Section 078446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.
5. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for installation in wood- and metal-framed assemblies of insulation specified by referencing this Section.

1.3 ACTION SUBMITTALS

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

B. In addition for Spray-applied cellulose insulation:

1. Manufacturer's written certification that product contains no asbestos, fiberglass or other man-made mineral fibers.
2. Manufacturer's written certification that product contains no Urea-Formaldehyde Resins.
3. Certification that product meets Class 1 Class A per ASTM E 84/ UL 723

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive, sealant, and sealant primer.
1. Provide quantity take offs for each adhesive, sealant, and sealant primer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

D. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives and Sealants: Provide the quantity of each interior adhesive, sealant and sealant primer used.

1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives and Sealants: Use interior adhesives, sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Multipurpose Construction Adhesives: 70 g/L.
2. Plastic Foam Adhesives: 50 g/L.
3. Architectural Sealants: 250 g/L.
4. Architectural Non-porous Sealant Primers: 250 g/l.
5. Architectural Porous Sealant Primers: 775 g/l.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.7 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 before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.

2. Type IV, 25 psi.
3. Type VI, 40 psi.

B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Fibrex Insulations Inc.
   2. Isolatek International.
   3. Owens Corning.
   4. Roxul Inc.
   5. Thermafiber.

B. Unfaced, Mineral-Wool Board Insulation: ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

   1. Nominal density of 6 lb/cu. ft., Type II, thermal resistivity of 4.16 deg F x h x sq. ft./Btu x in. at 75 deg F.
   2. Thickness: 3 inches unless otherwise indicated.

2.3 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: 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.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

   1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.

2.4 SPRAY-APPLIED CELLULOSIC INSULATION (AS1)

A. Self-Supported, Spray-Applied Cellulosic Insulation: ASTM C 1149, Type I (materials applied with liquid adhesive; suitable for either exposed or enclosed applications), chemically treated for flame-resistance, processing, and handling characteristics.

   1. Basis-of-Design Products: International Cellulos Corporation, K-13. Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Approved Equals

2. Coor Basis of Design: Grey
3. Thickness: 2 inches unless otherwise indicated.

2.5 SPRAY POLYURETHANE FOAM INSULATION

A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. BASF Corporation.
   b. Dow Chemical Company (The).
   c. Henry Company.

2. Minimum density of 1.5 lb/cu. ft., thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.6 INSULATION FASTENERS - BATT AND FOAM BOARD INSULATIONS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place.

1. Products: Subject to compliance with requirements, provide the following:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
   b. Gemco; Spindle Type.

2. Plate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized-steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
   a. AGM Industries, Inc.; SC150.
   b. Gemco; R-150 S-150.

2. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:
   a. Crawl spaces.
   b. Ceiling plenums.
   c. Soffit spaces.

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products: Subject to compliance with requirements, provide the following:
   a. AGM Industries, Inc.; TACTOO Adhesive.
b. Gemco; Tuff Bond Hanger Adhesive.

2.7 INSULATION FASTENERS - MINERAL WOOL BOARD INSULATION

A. Mechanical insulation hangers, fasteners, clips, hooks in accordance with insulation manufacturer’s written recommendations for mechanical attachment to building backup supports.

1. Design fasteners to withstand all combined applied loads.
2. Mid board fasteners if required penetrating air-barrier systems must be sealed air and water tight in accordance with air-barrier system specifications.

B. Insulation-Retaining Washers in accordance with insulation manufacturer’s written recommendations:

1. Self-locking washers formed from stainless steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 38 mm square or in diameter.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer’s written instructions applicable to products and applications indicated.

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. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer’s standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Mineral-Wool Board Insulation: Install insulation supports spaced approximately 610 mm 24 inches o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between cladding supports and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

B. Mineral Board Insulation: Comply with Section 042000 "Unit Masonry".
3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber 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. Examine surfaces and report unsatisfactory conditions in writing. Do not proceed until unsatisfactory conditions are corrected.

3.5 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates, other than mineral wool board, by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.

3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

B. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.6 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.

3.7 INSPECTION

A. Notify and coordinate review of completed installation of insulation assemblies prior to covering, with the Contractor and Owner's Representative as part of building commissioning.

END OF SECTION 072100
SECTION 072726 - 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 fluid-applied, vapor-retarding membrane air barriers.

B. Related Requirements:
   1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
   2. Section 071416 "Cold Fluid-Applied Waterproofing" for coordination with system materials and installations.

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 accessory materials 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. Review methods and procedures related to air barrier system including, but not limited to, the following:
   1. Meet with Architect, Owner, testing and inspecting agency representative, air barrier Installer, air barrier system manufacturer's technical representative, and installers whose work interfaces with or affects the air barrier, including installers of glazing and cladding assemblies.
   2. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.
   3. Review intersection details between air-barrier system and glazing, cladding, and if applicable roofing and waterproofing systems.
   4. Review Weather limitations for installation.
   5. Review UV exposure time limits.
   6. Review substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer/installer.
   7. Examine wall substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   8. Review transition flashings, special termination details, penetrations through air barrier and flashing, and condition of other construction that affects air barrier system.
   9. Review glazing and cladding support installation of anchorage and any penetrations through air barriers and penetration sealing methods and responsibilities.
10. Review temporary protection requirements for air barrier during and after installation.
11. Review air barrier observation and repair procedures after installation.
12. Review field quality control and testing requirements.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.
   1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
   2. Include details of interfaces with other materials that form part of air barrier.
   3. Include details of interfaces with glazing, cladding, waterproofing and roofing membranes.
   4. Include details of connections to adjoining work and comply with requirements of the COORDINATION section below.
   5. Submit only project specific details that have been reviewed and approved by the membrane manufacturer. Manufacturer's standard details are not acceptable.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
   1. In addition to experience qualification information provide a list of projects of similar nature by both manufacturer and installer which have been installed during last five (5) years.

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Manufacturers Certificates:
   1. Signed by air barrier manufacturer certifying that air-barrier systems complies with requirements specified in "Performance Requirements" Article.
      a. Submit evidence of compliance with performance requirements.

E. Submit air-barrier manufacturer's certification of air barriers and accessory materials ordered and supplied are compatible with each other, with Project materials that connect to or that come in contact with the barrier and are suited for purposes intended.

F. Submit letter indicating that manufacturer has reviewed project documents and will issue the specified warranty upon successful completion of the installation.

G. Submit manufacturer's current approval of installer and date of initial certification.

H. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.
I. Field quality-control and inspection reports.

1. Submit reports to Owner and Architect within five (5) working days of each site visit.

J. Warranties: Submit copies conforming to warranty requirements of this Section stating all obligations, remedies, limitations, and exclusions.

K. Minutes of preinstallation conference.

1.7 WARRANTY

A. Manufacturer’s Special Warranty. Manufacturer agrees to repair or replace waterproofing that does not comply with requirements or that fails in materials or workmanship within specified warranty period.

1. Special warranty also includes air barrier, membrane flashings, fasteners, air-barrier accessories and other components of the air-barrier system.

2. Warranty Period: Five (5) years from date of Substantial Completion.

B. Installers Warranty: Contractor shall correct defective work within a two (2) year period after date of substantial completion, including removal and replacement materials concealing waterproofing at no cost to the Owner.

1.8 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and anchor penetration assemblies with the manufacturers and installers of glazing, cladding, roofing, sealant and waterproofing assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer with ten (10) years of air barrier manufacturing experience for membrane systems of the types specified for this Project.

2. Minimum ten (10) years previous successful experience in installations of similar systems.

B. 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.

2. Installer having at least five (5) years experience installing air barrier systems identical to that used for this Project and has successfully completed a minimum of five pervious projects of similar in system and nature and of equal or greater size to this Project in the last year.

C. Testing Agency Qualifications:

1. Qualified according to ASTM E 329 for testing indicated.

D. Mockups: Build mockups to verify selections made under sample submittals and to set quality standards for materials and execution.
1. All materials and submittals materials that constitute the mockup(s) must be submitted and approved prior to mockup construction.
2. Build integrated mockups of exterior wall assembly as shown on Drawings or if not shown at a location directed by the Architect, incorporating backup wall construction, air barrier assembly, curtainwall assemblies, (ETA) glazing accessories, flashings, insulation, external cladding and other penetrations, and flashings to demonstrate surface preparation, crack and joint treatment, application of air barriers, installation of glazing accessories, sealants and the sealing of gaps, terminations of materials, transitions between materials, installation of anchors and supports for exterior closure assemblies.
3. Coordinate construction of mockups to permit inspection by observations by Architect and owner’s inspection agency. Provide notification a minimum of 72 hours in advance.
4. Mockups are to be reviewed and tested in phases or stages of completion. For example: air barrier installation and glazing accessories are to be installed and tested prior to installing cladding systems mockup. Coordinate phasing for each mockup type with Architect.
5. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
6. Prepare mockup for testing requirements: Testing of air barrier systems is to be performed prior to the installation of glazing and cladding systems.
7. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
8. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.
B. Mockup Testing: Air-barrier assemblies shall comply with performance requirements indicated, as evidenced by reports based on mockup testing by a qualified testing agency.

1. Adhesion Testing: Mockups will be tested for minimum air-barrier adhesion requirements, ”values as required by the primary membrane manufacturer for the applicable substrate.”
2. Wet-Film Testing: Air-barrier assemblies are to be tested for minimum wet film thickness installation according to manufacturers requirements.
3. Anchor penetration sealing.
4. Schedule testing times with the owners testing agency.
5. Notify Architect seven days in advance of the dates and times when mockups will be tested.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver air-barrier 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. Labels must be intact and legible.
B. Store materials in accordance with manufacturer’s recommendations.

1. Protect stored materials from direct sunlight.
C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

1.12 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended 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, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-retarding 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., when tested according to ASTM E 2357.

2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

   a. Synthetic Polymer Membrane:
   b. Basis of Design Products: Subject to compliance with requirements, provide Grace, W. R., & Co. - Conn.; Perma-A-Barrier Liquid. or comparable product by one of the following:
      1) Henry Company; Air-Bloc 33.
      2) Approved Equals.

2. Physical and Performance Properties:

   a. Thickness: 40 mil.
   b. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
   c. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M.
   d. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.

B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.

D. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
E. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

F. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil thick polyethylene film with release liner backing.

G. Manufacturer's stainless steel termination bars and stainless steel fasteners.

H. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

I. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

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 in writing that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

3.2 SURFACE PREPARATION

A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. 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 membrane.

E. Grind irregular construction joints to suitable flush surface.

F. Remove excess mortar from masonry ties, shelf angles, and other obstructions.

G. 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.
H. 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.

3.3 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Coordinate with section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments. Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfed gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

C. 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.

1. Provide termination bars at top of transition strips.
2. Provide termination bars at locations where transition strips attach to concrete or masonry.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. 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.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strips so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Transition Strip: Roll firmly to enhance adhesion. Extend transition strips into openings and beyond primary sealant line.

G. Seal strips and transition strips around penetrations with termination mastic.
H. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

I. 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 beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

A. General: Apply fluid 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. Apply fluid air-barrier material within manufacturer’s recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.

1. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied as directed by manufacturer.

C. Apply strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer’s written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner’s testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

F. Anchor Penetrations: Anchors that penetrate the air barrier assembly are to be sealed air and water tight to maintain air barrier performance requirements. Coordinate seal method and application with manufacturers and installers of penetrating systems. This requirement is in addition to any self gasketing membrane properties. Include these applications as part of the constructed mockup.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Coordinate testing schedule to permit observations by Owners representatives and Architect

1. Provide notification a minimum of 72 hours in advance.

C. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air-barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.
4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. 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.
8. Termination mastic has been applied on cut edges.
9. Strips and transition strips have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air-barrier and sealants) have complied with requirements for
    cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. All penetrations have been sealed.

D. Tests: As determined by Owner's testing agency from among the following tests:

1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to
   ASTM E 783 or ASTM E2357 as determined by the Owner and Testing agency.

2. Adhesion Testing: Air-barrier assemblies will be tested for minimum air-barrier adhesion "values
   as required by the primary membrane manufacturer for the applicable substrate" for each 300 sq.
   ft. of installed air barrier or part thereof.

3. Wet-Film Testing: Air-barrier assemblies are to be tested for minimum wet film thickness installation
   according to ASTM D4414 for each 300 sq. ft. of fluid installed air barrier or part thereof, however
   preform not less than 3 tests.

E. Air barriers will be considered defective if they do not pass tests and inspections.

1. Additional testing and inspecting, at Contractor's expense, will be performed to determine
   compliance of replaced or additional work with specified requirements.

2. Apply additional air-barrier material, according to manufacturer's written instructions, where
   inspection results indicate insufficient thickness.

3. Remove and replace deficient air-barrier components for retesting as specified above.

F. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 INSPECTION

A. Notify and coordinate review of completed installation of insulation assemblies prior to covering, with the
   Contractor and Owner's Representative as part of building commissioning.

3.8 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 required by
   manufacturer. If exposed to these conditions for more than 30 days, remove and replace air
   barrier or install additional, full-thickness, air-barrier application after repairing and preparing the
   overexposed membrane 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 by manufacturer of affected construction.

C. Remove masking materials after installation.
END OF SECTION 072726
SECTION 075419 - POLYVINYL-CHLORIDE (PVC) 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. Adhered PVC membrane roofing system.
2. Air barrier.
3. Roof insulation.
4. Tapered Roof Insulation

B. Related Sections:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, copings, flashings, and counterflashings.
4. Section 221423 "Storm Drainage Piping Specialties" for roof drains.
5. Section 264113 "Lightning Protection for Structures" for coordination with lightning protection systems installation.

1.3 DEFINITIONS

A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in 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 system manufacturer's technical representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.
10. Review field quality control and testing requirements.

B. Project Start-Up: Manufacturer's field technical representative is required to be on site for the first day of application.

1.5 ACTION SUBMITTALS

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

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Insulation and Tapered insulation, including slopes.
3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
4. Submit only project specific details that have been reviewed and approved by the membrane manufacturer. Manufacturer's standard details are not acceptable.
5. Shop drawing shall be signed by authorized representative of membrane manufacturer stating that submittal details conform to manufacturer's warranty requirements for this specific Project.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Cover Board.
4. Air Barrier.
5. Walkway pads or rolls.
6. Metal termination bars.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Manufacturer: In addition to experience qualification information provide a list of projects of similar nature by manufacturer which have been installed during last five (5) years.
2. For Installer: In addition to experience qualification information provide a list of projects of similar nature by installer which have been installed during last five (5) years.

B. Manufacturer Certificates:

1. Submit Division1 document "1.E.2 University of Missouri Roof System Manufacturers Certification" indicating that manufacturer has reviewed project documents, materials/systems will meet or exceed the specifications and will issue the specified warranty upon successful completion of the installation.
2. Submit manufacturer's current approval of installer and date of initial certification.
3. Product Certificates: From roofing manufacturer, certifying compatibility of roofing and accessory materials with Project materials that connect to or that come in contact with the roofing. Provide documentation of compatibility and adhesion with roofing and roofing membranes.

C. Solar Reflectance Index - Roof: Manufacturer's or fabricator's certificate indicating SRI of roofing materials.

D. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.
E. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

F. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in “Performance Requirements” Article.
   1. Submit "University of Missouri System Manufacturers Certification" noted in the Warranty section below.
   2. Submit evidence of compliance with performance requirements.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

H. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

I. Minutes of preinstallation conference.

J. Field quality-control reports.
   1. Submit reports to Owner and Architect within five (5) working days of each site visit.

K. Warranties: Copies of Roofing Manufacturer’s special warranty, roofing Installer’s warranty, stating obligations, remedies, limitations, and exclusions. Refer to requirements in Division 1 documents 1.E.2 University of Missouri Roof System Manufacturers Certification and 1.E.3 University of Missouri Contractors Roofing/Flashing/Sheet Metal Guarantee.

1.7 CLOSEOUT SUBMITTALS

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

B. Inspection Reports: Copies of roofing system manufacturer’s progress inspection reports and final report of completed roofing installation.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer’s product and that is eligible to receive manufacturer’s special warranty.
   1. Installer having at least ten (10) years experience installing membrane roofing system identical to that used for this Project and has successfully completed a minimum of ten (10) previous projects of similar in system and nature and of equal or greater size to this Project in the last year; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

C. Upon completion of installation, a technical representative of the manufacturer shall conduct an inspection to certify that roofing systems has been installed according to the manufacturer’s most current published specifications, details and approved shop drawings. Manufacturer’s field technical representative is to provide a written report to Owner and Architect within five (5) working days of each site visit.
   1. See additional requirements under the Field Quality Control article of this specification section.
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 system manufacturer. Protect stored liquid material from direct sunlight.

   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer’s written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and anchor penetration assemblies with the manufacturer's and installers of sheet metal, underlayment, glazing, sealant and cladding systems. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

B. Coordinate with installation of Lightning Protection system indicated in Section 264113 "Lightning Protection for Structures." Provide flashings, sealants, and mastics to provide a watertight sealant between the lightning protection system mounting and conductor system supports and the roofing system.

1.11 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

   1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, air barriers, roofing accessories, and other components of membrane roofing system.

   2. Warranty Period: Twenty (20) years from date of Substantial Completion.

B. Special Project Warranty: Installer is to submit the fully executed “University of Missouri Contractors Roofing/Flashing/Sheet Metal Guarantee” on the form attached in Division 1, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, air barriers, and walkway products, for the following warranty period:

   1. Warranty Period: Three (3) years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain components including roof insulation fasteners for roofing system from same manufacturer as membrane roofing.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane 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. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals’ “RoofNav” for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: SH.

D. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

2.3 PVC MEMBRANE ROOFING

A. PVC Sheet: (Either)

1. ASTM D 4434, Type II, Grade I, glass fiber reinforced and felt or fleece backed.
2. ASTM D 4434 Type III, fabric reinforced and fleece backed.
3. Products: Subject to compliance with requirements, provide one of the following:

   a. Carlisle SynTec, Incorporated; FRS
   b. FiberTite; FiberTite SM.
   c. GAF Materials Corporation.
   d. Sarnafil Inc.; Sarnafil G410.

4. Thickness: 60 mils, nominal.
6. Polymer Thickness: Evenly distributed above and below membrane reinforcement.
7. Backing Thickness:
8. Lacquer Coating: Factory applied coating to membrane surface for better resistance to surface environmental concerns.
2.4 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as PVC sheet membrane.

C. Coated Sheet Metal Flashing: Manufacturers standard factory coated PVC roofing sheet metal flashing shapes.

D. Bonding Adhesive: Manufacturer's standard low-rise foams for installation of each type of roofing system component.

E. Metal Termination Bars: Manufacturer provided, predrilled type 316 stainless-steel termination bars, approximately 25mm wide by 3 mm 1/8 inch thick and 1 inch tall; with stainless-steel anchors. Pre-drill fastener holes at 6 inches on-center with stainless steel fasteners of the same material.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

G. Closure Tape: Pressure-sensitive tape of type recommended by roofing manufacturer for sealing roof membrane edge terminations.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.5 AIR BARRIER

A. Modified Bituminous Sheet: 32-mil- thick, self-adhering sheet consisting of 28 mils of rubberized asphalt laminated to a 4-mil- thick, cross-laminated polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

1. Basis of Design Products: Subject to compliance with requirements provide Sarnafil Inc.; Sarnavap, Self-Adhered or comparable product by one of the following:
   a. Carlisle SynTec, Incorporated; FRS
   b. FiberTite; FiberTite SM.

2. Physical and Performance Properties:
   a. Air Permeance: Maximum 0.004 cfm/sq. ft.; ASTM E 96.
   b. Tensile Strength: Minimum 6 lbf/in; ASTM D 5147.
   c. Ultimate Elongation: 52/24 percent; ASTM D 5147.
   d. Water Absorption: Maximum 0.15 percent weight gain after 48-hour immersion at 70 deg F; ASTM D 5147.
   e. Vapor Permeance: Maximum 0.05 perm; ASTM E 96/E 96M, Water Method.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured by PVC membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Approvals-approved roof insulation.
1. Provide continuous insulation system installation of a average minimum R-30 total per roof level area, unless otherwise noted.
   a. Average R value is to be determined before adding the saddles and crickets.
   b. Minimum thickness of assembly 1-1/2 inches.

B. Polysisocyanurate Board Insulation: (Base Layer) ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. For adhered purposes, 4 foot by 4 foot panels unless otherwise approved by roofing manufacturer,

C. Tapered Insulation: (Subsequent Layers) Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated. Provide ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces. For adhered purposes, 4 foot by 4 foot panels unless otherwise approved by roofing manufacturer.

1. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.7 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Bead-Applied Insulation Adhesive: Insulation manufacturer’s recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.

C. Cover Board: High density polysisocyanurate board:

1. Basis of Design Products: Subject to compliance with requirements provide Sarnafil Inc.; Sarnatherm Roof Board -H, or comparable product by approved roofing membrane manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
5. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
6. Verify that any required penetration or joint fire stopping systems have been installed prior to covering.

B. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.
1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 ROOFING SYSTEMS INSTALLATION SUMMARY

A. For Concrete Structural Deck.

   1. Using specified primer, prime concrete roof deck and install a self-adhered air barrier to the concrete deck.
   2. Using specified low rise foam adhesive, adhere roof insulation (base layer, subsequent layer, and cricket).
   3. Using specified adhesive, adhere Coverboard to roof insulation.
   4. Using specified adhesive, adhere PVC membrane to roof coverboard and insulation. In addition provide specified fasteners where required by roofing system manufacturer at edge and detail terminations.
   5. Install base flashing system as specified and detailed.

3.4 AIR BARRIER INSTALLATION

A. Install air barrier sheets according to roofing manufacturer's written instructions and recommendations.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Apply sheets from low to high points of decks to ensure that laps shed water.

D. Apply and firmly adhere sheets over area to receive air barrier. Accurately align sheets and maintain uniform 3-inch minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

   1. Install in temperatures 32 deg f and above.

E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

F. Seal edges of sheet-air barrier terminations with mastic.

G. Repair tears, voids, and lapped seams in air barrier not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet air barrier extending 6 inches beyond repaired areas in all directions.
H. Roll air barrier laps. Completely seal air barrier at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

3.5 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. 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 with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

G. Adhered Insulation: Install each layer of insulation and adhere to substrate as follows:

1. Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

H. 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 in each direction. Loosely butt cover boards together.

1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.

2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3. Fasten cover boards to insulation and substrates in ribbons of bead-applied low-rise foam adhesive, firmly pressing and maintaining board in place.

3.6 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

1. Install sheet according to ASTM D 5036.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing. The adhesive shall be applied in smooth, even coating with no gap, globs, puddles, or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be coated with adhesive. Press membrane into place with roller as required by manufacturer.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing as required by manufacturer to meet uplift requirements.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
   2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
   3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.7 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions. Flashing heights shall be a minimum of 8 inches and a maximum of 30 inches.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Apply pressure-sensitive closure tape at roofing edge transitions to air barriers or underlayments for sealing roof membrane.

F. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.8 LIGHTNING PROTECTION SYSTEM

A. Coordinate with installation of Lightning Protection system indicated in Section 264113 "Lightning Protection for Structures." Provide flashings, sealants, and mastics to provide a watertight sealant between the lightning protection system mounting and conductor system supports and the roofing system.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner may a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service:
1. Project Start-Up: Arrange for manufacturer's field technical representative to be on site for the first day of application and provide a written report to the designer.
2. Inspect installations at a minimum of 25, 50 and 90 percent completion.
3. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
4. Submit written reports within five (5) working days of each site visit.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075419
SECTION 076200 - 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. Manufactured reglets with counterflushing.
2. Formed low-slope roof sheet metal fabrications.
3. Formed equipment support flashing.
4. Formed overhead-piping safety pans.

B. Related Requirements:

1. Section 033500 "Precast Architectural Concrete" for coordination of reglets cast into precast cladding panels.
2. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 075419 "Polyvinyl-Chloride (PVC) Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.
5. 084413 "Glazed Aluminum Curtain Walls" for coordination of metal flashings and closures with curtain wall assemblies.
6. 084423 "Structural-Sealant-Glazed Curtain Walls" for coordination of metal flashings and closures with curtain wall assemblies.

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 metal flashing materials and finishes installed with curtain wall materials.

C. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and anchor penetration assemblies with the manufacturers and installers of cladding, glazing, roofing and waterproofing assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.
1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to sheet metal and roofing systems including, but not limited to, the following:

1. Meet with Owner, Architect testing and inspecting agency representative, sheet metal installer/fabricator, roofing installer, roofing system manufacturer's technical representative, curtain wall installer and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
4. Review existing substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer/installer.
5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review temporary protection requirements for roofing during and after installation.
7. Review governing regulations and requirements for insurance and certificates.
9. Review field quality control and testing requirements.

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. Submit only project specific details. Manufacturer's standard details are not acceptable.
3. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
4. Include identification of material, thickness, weight, and finish for each item and location in Project.
5. Include details for forming, including profiles, shapes, seams, and dimensions.
6. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
7. Include details of termination points and assemblies.
8. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
9. Include details of roof-penetration flashing.
10. Include details of edge conditions and counterflashings as applicable.
11. Include details of special conditions.
12. Include details of connections to adjoining work.
13. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

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 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 long and in required profile. Include fasteners and other exposed accessories.
3. Unit-Type Accessories and Miscellaneous Materials: Full-size Sample.
1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator: In addition to experience qualification information provide a list of projects of similar nature by both manufacturer and installer which have been installed during last five (5) years.

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

D. Low-Emitting Materials - Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior sealant, and sealant primer.
   1. Provide quantity take offs for each sealant, and sealant primer.

E. Product Test Reports: For each product, for tests performed by a qualified testing agency.

F. Minutes of preinstallation conference.

G. Sample Warranty: Copies of Waterproofing Manufacturer's special warranty, roofing Installer's warranty, stating obligations, remedies, limitations, and exclusions.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

B. Low-Emitting Materials - Sealants: Provide quantity of each interior sealant and sealant primer used.

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. The work of this section shall be performed by a company which specializes in the type of exterior sheet metal work required for this Project, and shall have a minimum of five (5) years successful experience in construction and supervision of metal wall panel work.

   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.

B. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:
   1. Architectural Sealants: 250 g/L.
   2. Architectural Non-porous Sealant Primers: 250 g/l.
   3. Architectural Porous Sealant Primers: 775 g/l.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
1. Build mockup of typical roof edge, including fascia trim, coping, approximately 10 feet long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
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.

1.9 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.

B. Special Project Warranty: Installer is to submit the fully executed "University of Missouri Contractors Roofing/Flashing/Sheet Metal Guarantee" on the form attached in Division 1, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, air barriers, and walkway products, for the following warranty period:

1. Warranty Period: Three (3) 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" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. FM Approvals Listing: Manufacture and install copings roof edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with name of fabricator and design approved by FM Approvals.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to
prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. 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, 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. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color:
   a. Sheet metal including copings at curtain wall assemblies is to match curtain wall color and finish.
   b. Sheet metal copings at precast cladding panels is to be a custom color to match panels.

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.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 316, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 4 (polished directional satin).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 40 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Coordinate products that interface with roofing systems and roofing system air barriers to confirm compatibility.

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

   a. Carlisle Residential, a division of Carlisle Construction Materials; WIP 300HT.
   c. Henry Company; Blueskin PE200 HT.
   d. Comparable products coordinated with and included as part of approved roofing systems.


4. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
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.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Stainless Steel: ASTM B 32, Grade Sn60, 60-40 tin/lead, with acid flux of type recommended by stainless-steel sheet manufacturer.

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 wide and 1/8 inch thick.

E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight. Comply with Section 079200 “Joint Sealants.”

F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-itched and -welded corners and junctions and with interlocking counterflushing on exterior face, of same metal as reglet.

1. Coordinate with precast concrete cladding systems.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Cheney Flashing Company.
   b. Fry Reglet Corporation.
   c. Heckmann Building Products, Inc.
   d. Hickman, W. P. Company.
   e. Hohmann & Barnard, Inc.
   g. National Sheet Metal Systems, Inc.
   h. Sandell Manufacturing.

3. Material: Stainless steel, 0.019 inch thick.

4. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section.
5. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible
      flashing in reglet where clearance does not permit use of standard metal counterflashing or
      where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to
      prevent wind uplift of counterflashing's lower edge.

6. Finish: Mill

2.6 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 on slope and location lines indicated on Drawings and within 1/8-inch offset
   of adjoining faces and of alignment of matching profiles.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

D. 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.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from
   compatible, noncorrosive metal.

F. 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.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric
   sealant unless otherwise recommended by sealant manufacturer for intended use.

H. Do not use graphite pencils to mark metal surfaces.

2.7 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Splash Pans: Fabricate to dimensions and shape required and from the following materials:
   1. Stainless Steel: 0.019 inch thick.
2.8 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: As Indicated on Drawings.
2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
3. Fabricate from the Following Materials:
   a. Aluminum: 0.050 inch thick.
      1) Color to match adjacent curtain wall system at curtain wall assemblies.
      2) Custom Color to match adjacent precast concrete a precast concrete wall cladding assemblies.

B. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

C. Counterflushing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

D. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: thickness minimum to match coping material at aluminum assemblies.
2. Stainless Steel: 0.016 inch thick at stainless steel flashing assemblies.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.

B. Overhead-Piping Safety Pans: Fabricate from the following materials:

1. Stainless Steel: 0.025 inch 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. 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 staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

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. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. 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 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 with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch 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 for nails and not less than 3/4 inch for wood screws substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in 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; however, reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not use torches for soldering.
2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.4 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 FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals’ listing for required windstorm classification.

C. 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.

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

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of anchor and washer at 36-inch centers unless otherwise indicated.

3.5 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. Reglets: Installation of reglets is specified in Section 033000 “Cast-in-Place Concrete.”

3.6 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.

B. Overhead-Piping Safety Pans: Suspend pans from structure above, independent of other overhead items such as equipment, piping, and conduit, unless otherwise indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.
3.7  ERECTION TOLERANCES

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

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.8  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.

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 076200
SECTION 078413 - PENETRATION 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. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
B. Related Sections:
   1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections and architectural precast concrete cladding panels.

1.3 PERFORMANCE REQUIREMENTS
A. 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.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. 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 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.
C. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. 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.
1.5 INFORMATIONAL SUBMITTALS

1. Qualification Data: For qualified Installer: In addition to experience qualification information provide a list of projects of similar nature by both manufacturer, installer and applicator which have been installed during last five (5) years.

B. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

C. Low-Emitting Materials - Sealants: Include manufacturer’s printed statement of VOC content in g/l for each interior sealant, and sealant primer.

1. Provide quantity take offs for each sealant, and sealant primer.

D. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer’s written recommendations.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

F. Minutes of preinstallation conference.

1.6 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Sealants: Provide the quantity of each interior sealant and sealant primer used.

1.7 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" and employs installers and supervisors who are trained and approved by penetration firestopping manufacturer.

B. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Architectural Sealants: 250 g/L.
2. Architectural Non-porous Sealant Primers: 250 g/l.
3. Architectural Porous Sealant Primers: 775 g/l.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. 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."

D. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to penetration firestopping systems including but not limited to, the following:

1. Meet with Owner, Architect testing and inspecting agency representative, penetration firestopping systems installer, manufacturer's technical representative, and installers whose work interfaces with or affects penetration firestopping systems.
2. Review construction schedule. Verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special details, materials, assemblies and compliance with assembly classifications.
4. Examine substrate conditions and finishes for compliance with requirements.
5. Review temporary protection requirements for during and after installation.
6. Review governing regulations and requirements for insurance and certificates.
7. Review inspection and testing requirements.

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.

C. Notify testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Grace Construction Products.
2. Hilti, Inc.
3. Specified Technologies Inc.
4. 3M Fire Protection Products.
5. USG Corporation.

B. Source Limitations: For each opening, use single tested, listed system from single manufacturer.
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.

1. Fire-resistance-rated walls include fire walls fire-barrier walls and fire partitions.
2. 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.

1. Horizontal assemblies include floors.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.

D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or 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. Fillers for sealants.

2. Temporary forming materials.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

C. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

D. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

E. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
F. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

G. 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. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

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 nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

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

PART 3 - EXECUTION

3.1 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 and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

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.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. 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 - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage.”
   2. Contractor’s name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer’s name.
   6. Installer’s name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.
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 PENETRATION FIRESTOPPING SCHEDULE

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

B. Firestopping with No Penetrating Items:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

C. Firestopping for Metallic Pipes, Conduit, or Tubing:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

D. Firestopping for Nonmetallic Pipe, Conduit, or Tubing:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

E. Firestopping for Electrical Cables:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

F. Firestopping for Cable Trays with Electric Cables:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

G. Firestopping for Insulated Pipes:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

H. Firestopping for Miscellaneous Electrical Penetrants:
   2. F-Rating: 1 hour or 2 hours.
   3. Type of Fill Materials: As required to achieve rating.
I. Firestopping for Miscellaneous Mechanical Penetrants:
   2. F-Rating: 1 hour or 2 hours as required to achieve rating.
   3. Type of Fill Materials: As required to achieve rating.

J. Firestopping for Groupings of Penetrants:
   2. F-Rating: 1 hour or 2 hours.
   3. Type of Fill Materials: As required to achieve rating.

END OF SECTION 078413
SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

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.
   2. Joints at exterior curtain-wall/floor intersections.

B. Related Sections:
   1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.3 ACTION SUBMITTALS

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

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.
   1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data For qualified Installer: In addition to experience qualification information provide a list of projects of similar nature by the installer which have been installed during last five (5) years.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Low-Emitting Materials - Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior sealant and sealant primer.
   1. Provide quantity take offs for each adhesive, sealant, and sealant primer.
E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

F. Minutes of preinstallation conference.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Sealants: Provide the quantity of each interior sealant and sealant primer used.

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."

B. Installer Qualifications: A firm experienced in installing fire-resistive joint systems 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 fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Low-Emitting Materials - Sealants: Use interior sealants and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Architectural Sealants: 250 g/L.
2. Architectural Non-porous Sealant Primers: 250 g/l.
3. Architectural Porous Sealant Primers: 775 g/l.

D. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

   a. Fire-resistive joint system products bear classification marking of qualified testing agency.
   b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

       1) UL in its "Fire Resistance Directory."

E. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to fire-resistive joint systems including but not limited to, the following:

1. Meet with Owner, Architects, Owner's testing and inspecting agency representative, joint systems installer, manufacturer's technical representative, and installers whose work interfaces with or affects joint systems.
2. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review special details, materials, assemblies and compliance with assembly classifications.
4. Examine substrate conditions and finishes for compliance with requirements.
5. Review temporary protection requirements for during and after installation.
6. Review governing regulations and requirements for insurance and certificates.
7. Review inspection and testing requirements

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistant joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistant joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistant joint 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 fire-resistant joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistant joint systems.

C. Notify Owner’s testing agency at least seven days in advance of fire-resistant joint system installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistant joint 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 assemblies in or between which fire-resistant joint systems are installed. Fire-resistant joint 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 fire-resistant joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls; walls and floors.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grace Construction Products.
   b. Hilti, Inc.
   c. Specified Technologies Inc.
   d. 3M Fire Protection Products.
   e. USG Corporation.

C. Joints at Exterior Curtain-Wall/Floor intersections and at exterior Architectural Precast concrete cladding panels: Provide fire-resistant joint systems with rating determined by ASTM E 119 based on testing at a positive pressure differential of 0.01-inch wg or ASTM E 2307:

1. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Grace Construction Products.
   b. Hilti, Inc.
c. Johns Manville.
e. Roxul, Inc.
f. Specified Technologies Inc.
g. 3M Fire Protection Products.
h. Thermafiber, Inc.
i. USG Corporation.

D. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

E. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems 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: Clean joints immediately before installing fire-resistive joint systems 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 fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. 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 fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system 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 fire-resistive joint system's seal with substrates.

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 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 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 fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance
   ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth,
   uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify fire-resistive joint systems with preprinted metal or plastic labels. Attach labels permanently to
   surfaces adjacent to and within 6 inches of joint edge so labels will be visible to anyone seeking to remove
   or penetrate joint 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:

   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.

B. Where deficiencies are found or fire-resistant joint systems are damaged or removed due to testing, repair
   or replace fire-resistant joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistant joint systems with other construction only after inspection reports are
   issued and installations comply with requirements.

3.6 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning
   materials that are approved in writing by fire-resistant joint 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 fire-resistant joint
   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-resistant joint systems complying with
   specified requirements.

3.7 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance
   Directory" under product Category XHBN or Category XHDG.

B. Wall-to-Wall, Fire-Resistive Joint Systems:
1. UL-Classified Systems: WW-D - 0000-0999.
2. Assembly Rating: 1 hour or 2 hours.
3. Basis of Design, UL, HW-D-0021
4. Assembly Rating: 2 hours as required by wall assembly.
5. Nominal Joint Width: 1 inch.
6. Movement Capabilities: 25 percent compression or extension

C. Wall-to-Wall, Fire-Resistive Joint Systems

1. UL-Classified Systems: WW-D - 0000-0999.
2. Basis of Design UL, WW-D-0083.
3. Assembly Rating: 1 hour or 2 hours as required by wall assembly.
4. Nominal Joint Width: 1 inch.
5. Movement Capabilities: 25 percent compression.

D. Wall-to-Wall, Fire-Resistive Joint Systems

1. UL-Classified Systems: WW-D - 0000-0999.
2. Basis of Design UL, WW-D-0084.
3. Assembly Rating: 1 hour or 2 hours as required by wall assembly.
4. Nominal Joint Width: 1 inch.
5. Movement Capabilities: 25 percent compression.

E. Head-of-Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D - 0000-0999.
2. Basis of Design UL, HW-D-0060.
3. Assembly Rating: 1 hour or 2 hours as required by wall assembly.
4. Nominal Joint Width: 1 inch or 2 inch.
5. Movement Capabilities: Insert number 100 percent compression or extension.

F. Head of Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D - 0000-0999.
2. Basis of Design UL, HW-D-0078.
3. Assembly Rating: 2 hours as required by wall assembly.
4. Nominal Joint Width: 2 inch.
5. Movement Capabilities: 25 percent compression.

G. Head of Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D - 0000-0999.
2. Basis of Design UL, HW-D-0079.
3. Assembly Rating: 1 hour or 2 hours as required by wall assembly.
5. Movement Capabilities: 25 percent compression.

H. Head of Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D - 0000-0999.
2. Basis of Design UL, HW-D-0119.
3. Assembly Rating: 2 hours as required by wall assembly.
4. Nominal Joint Width: 1 inch.
5. Movement Capabilities: 100 percent compression.

I. Head of Wall, Fire-Resistive Joint Systems:

1. UL-Classified Systems: HW-D - 0000-0999.
2. Basis of Design UL, HW-D-1037.
3. Assembly Rating: 2 hours as required by wall assembly.
4. Nominal Joint Width: 3-1/2 inches.
5. Movement Capabilities: 14 percent compression.

J. Perimeter Fire-Resistive Joint Systems:

2. Integrity Rating: 2 hours.
3. Basis of Design: UL, FW-D-0036
4. Linear Opening Width: 1 inches (203 mm).
5. Movement Capabilities: Class II and Class III - 25 percent compression or extension.

END OF SECTION 078446
SECTION 079200 - 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. Urethane joint sealants.
3. Latex joint sealants.
4. Preformed acoustic joint sealants.
5. Acoustical Putty Pads at electrical device backing boxes.

B. Related Sections:

2. Section 079205 "Acoustic Sealant" for acoustic sealants, accessories and installation.
3. Section 084423 "Structural-Sealant-Glazed Curtain Walls" for structural and other glazing sealants.
4. Section 088000 "Glazing" for glazing sealants.
5. Section 093000 "Tiling" for sealing tile joints.
6. Section 095113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.
7. Section 321373 "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer’s written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

   a. Exception: Preconstruction Field- adhesion Testing will be required for each individual exterior enclosure/envelope assemblies.

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 application indicated below:
   a. Each kind of sealant and joint substrate indicated.
3. Notify Architect seven 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 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.

C. Pre Construction Stain Testing: Conduct stain tests according to ASTM C1248 or actual in situ testing,
   on actual substrate materials with orientation and exposure that replicates finished joint conditions, to verify
   that sealants will not stain joint substrates.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing
   the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint
   sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the
   appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Low-Emitting Materials - Sealants: Include manufacturer's printed statement of VOC content in g/l for each
   interior sealant, and sealant primer.
   1. Provide quantity take offs for each sealant, and sealant primer.

C. Product Certificates: For each kind of joint sealant and accessory from manufacturer.
D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion 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 needed for adhesion.

F. 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.

G. Field-Adhesion Test Reports: For each sealant application tested.
   1. Submit written reports within five (5) working days of each site visit.

H. Minutes of preinstallation conference.

1.6 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Sealants: Provide the quantity of each interior sealant and sealant primer used.

B. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer’s authorized representative who is trained and approved for installation of units required for this Project.

B. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Architectural Sealants: 250 g/L.
   2. Architectural Non-porous Sealant Primers: 250 g/l.
   3. Architectural Porous Sealant Primers: 775 g/l.

C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

D. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. 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.

F. Preinstallation Conference: Conduct conference at Project site.
1.8 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

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

1.9 WARRANTY

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

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

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

1. Silicone Sealants: 20 years from date of Substantial Completion.
2. Urethane Sealants: 5 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 structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural 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 MATERIALS, GENERAL

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

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of standard colors.

2.2 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin), 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.

2.3 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.

D. Acoustical electrical Back Box Backer: Flexible putty pad which provides high acoustical ratings at outlet boxes in acoustical-rated walls.

1. Refer to AC series drawings for acceptable manufacturers.

   a. 3M
   b. Approved equals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.
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, rust, laitance, release agents, 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. Cast stone products.
   d. 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. 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.
4. Where silicones sealants are to bond directly to urethane sealants; apply urethanes first, allow urethane sealant to cure per manufacturers recommendation, then prime and apply silicone sealant.

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.
   a. Dry tool silicone sealant joints.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Installation of Preformed Acoustic Joint-Sealant System: Comply with the following requirements for interior application:

1. Provide air tight installation. Install preformed joint systems in compliance with manufacturer's written instructions.
2. Apply sealant or primers to each side of joint to produce in compliance with preformed sealant system manufacturer’s written instructions.

H. Produce seal continuity at ends, turns, and intersections of 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 10 tests for the first of joint length for each kind of sealant and joint substrate.
   b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.

   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 passes 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 fill, sealant configuration, and sealant dimensions.

   a. Submit written reports within five (5) working days of each site visit.

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.

C. Examine sealed outlets to ensure proper installation of acoustical outlet backer before concealing or enclosing areas.

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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Pourable, Traffic-Grade, Urethane Joint Sealant - Urethane Sealant Type 1: Interior joints in horizontal traffic surfaces.

   1. Joint Locations:

      a. Isolation and contraction joints in cast-in-place concrete slabs.
      b. Tile control and expansion joints.
      c. Joints between different materials listed above.


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

         1) BASF Building Systems; Sonolastic SL 1.
         2) Pecora Corporation; Urexpan NR-201.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) BASF Building Systems; Sonolastic SL 2.
      2) Pecora Corporation; Dynatrol II-SG.
      3) Sika Corporation, Construction Products Division; Sikaflex 2c SL.
      4) Tremco Incorporated; Vulkem 45SSL.

4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of standard colors.


1. Joint Locations:
   b. Joints between plant-precast architectural concrete units.
   c. Joints between plant-precast architectural concrete and glazing systems.
   d. Control and expansion joints in unit masonry.
   e. Joints between metal panels.
   f. Joints between different materials listed above.
   g. Control and expansion joints in ceilings and other overhead surfaces.
   h. Other joints as indicated.

2. Non-Staining, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) BASF Building Systems; Omniseal 50.
      2) Dow Corning Corporation; 756 SMS.
      3) GE Advanced Materials Momentive; GE SiIPruf NB SCS9000.
      4) Pecora Corporation; 890NST.
      5) Sika Corporation, Construction Products Division; SikaSil WS 295.
      6) Sika Corporation, Construction Products Division; SikaSil N+.
      7) Tremco Incorporated; Spectrem 3.

C. Mildew-Resistant Silicone Joint-Sealant - Silicone Type 4: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:
   a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
   b. Tile control and expansion joints where indicated.
   c. Other joints as indicated.

2. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) BASF Building Systems; Omniplus.
      2) BASF Building Systems; 898.
      3) Dow Corning Corporation; 786 Mildew Resistant.
3. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of standard colors.

D. Latex Joint Sealant - Latex Type 1: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:
   a. Control and expansion joints on exposed interior surfaces of exterior walls.
   b. Perimeter joints of exterior openings where indicated.
   c. Tile control and expansion joints.
   d. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
   e. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
   f. Penetration perimeter joints.
   g. Other joints as indicated.

2. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
   a. Products: Subject to compliance with requirements, provide one of the following:
      
      1) BASF Building Systems; Sonolac.
      2) GE Advanced Materials Momentive; RCS20.
      3) Pecora Corporation; AC-20+.
      4) Tremco Incorporated; Tremflex 834.

3. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of standard colors.

E. Acoustical Joint Sealant - Refer to Section 079205 "Acoustic Sealants."

F. Preformed Acoustic Joint Sealant: Preformed sealant shall be silicone pre-coated, preformed, pre-compressed, self-expanding, sealant system. Expanding foam to be cellular foam impregnated with a water-based, non-drying, 100% acrylic dispersion. Seal shall combine factory-applied, low-modulus silicone and a backing of acrylic-impregnated expanding foam into a unified hybrid sealant system.

G. Preformed sealant shall be comprised of Multiple silicone external color facings to be factory-applied to the foam while it is partially pre-compressed to a width greater than maximum joint extension and cured before final compression. When compressed to final supplied dimension, a bellow(s) to handle movement must be created in the silicone coatings. Silicone coatings to be available in a range of not less than 26 standard colors for coordination with typical building materials.

END OF SECTION 079200
SECTION 079205 – ACOUSTIC SEALANT

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. All Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. The Work of this Section includes all labor, materials, equipment, and services necessary to provide permanently resilient acoustic sealant and backing materials as specified herein and as shown on the drawings. Acoustic sealant is required at acoustically sensitive locations including, but not limited to, the resilient sealing of building system penetrations, the resilient sealing of acoustic isolations joints between dissimilar building materials and substrates, (such as CMU wall to concrete floor), and equipment room perimeters.

1.3 RELATED SECTIONS

A. Division 3 – Concrete
B. Division 4 – Masonry
C. Division 081113 – Hollow Metal Doors and Frames
D. Division 083473 – Sound Control Doors
E. Division 092316 – Resiliently Supported Partition Assemblies
F. Division 092600 – Barrier Ceilings
G. Division 092900 – Gypsum Board
H. Division 21 – Fire Protection
I. Division 22 - Plumbing
J. Division 23 – HVAC
K. Division 24 – Air Distribution

1.4 MATERIAL DESCRIPTION

A. The acoustic sealant shall be a permanently resilient, non-hardening, non-bleeding, caulking material. The elastomeric qualities of the acoustic sealant shall comply with all performance requirements of sealants specified at similar locations as indicated in the contract documents.
1.5 SUBMITTALS

A. Product Data: For each product specified, include physical characteristics and details showing compliance with these requirements and compatibility with other materials and paints. Provide samples of each sealant to be used.

B. Acoustic requirements: Sealant shall be permanently resilient and capable of high elongation, +/- 50%. Fire rated acoustic sealants shall also be permanently resilient and capable of a +/- 25% elongation.

C. Manufacturer’s recommended application procedures.

PART 2 - PRODUCTS

2.1 CONCEALED SEALANTS:

A. Silicone – Hilti CP 601s (Fire rated)
B. Silicone – STI Sil 300
C. Silicone – GE Silpruf SCS 2000 (Fire rated)
D. Silicone – Tremco Fyresil (Fire rated)

2.2 EXPOSED SEALANTS

A. One part polyurethane – Sikaflex 15LM
B. Two part polyurethane – Sikaflex 2c
C. Two part polyurethane – Pecora Dynatrol II
D. One part polyurethane – Tremco Dymonic FC (paintable after cured)

ACRYLIC LATEX BASED SEALANTS WILL NOT BE ACOUSTICALLY ACCEPTABLE.
ACRYLIC-SILICONE HYBRID SEALANTS MAY NOT BE ACOUSTICALLY ACCEPTABLE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before commencing installation, examine the substrate and surrounding conditions to insure there are no rigid connections between building elements and structure and no superfluous building materials have fallen into the void and are bridging the separation to be acoustically sealed.

3.2 PREPARATION

A. Clean and prepare substrate, remove any superfluous material that has bridged the void where sealant is to be applied.
3.3 INSTALLATION

A. Provide backing materials if required, for proper application of sealant. The sealant shall be applied according to the manufacturer’s guidelines so as to achieve a uniform, minimum ¼” thick round bead and to achieve an airtight seal.

B. No rigid material or connection shall bridge the separation when the sealant is installed; separations requiring acoustic isolation, as shown on the drawings and as specified herein, shall be inspected by the Architect, or Acoustic Consultant prior to installation. Removal of sealant may be requested by the Acoustic Consultant for sample inspection. If a sample inspection by the Acoustic Consultant reveals bridging, the Acoustic Consultant reserves the right to have any and all sealant removed for inspection.

C. Refer to 079200 for additional installation requirements.

D. Acoustically Sealed Penetrations (Refer to AC Drawing Details):

1. For new or existing CMU construction, provide noise and vibration isolation of mechanical system penetrations as follows:
   a. Provide core holes for each individual pipe or duct penetration. Core hole shall be a minimum 1” larger than scheduled pipe or duct passing through the wall to allow penetration to be packed solidly with mineral wool or glass fiber for the full depth of the wall.
   b. Ensure penetrating duct or pipe is centered in the opening to allow for isolating material to completely surround the pipe or duct.
   c. Pack annular space to full depth of penetration with clean glass fiber or rockwool material flush to edges of wall.
   d. Seal full perimeter of annular opening with acoustic sealant to minimum ½” depth to achieve airtight seal.
   e. Each penetration must be individually sealed; multiple pipes routed through a single opening are not acceptable unless specifically detailed.

2. For new gypsum drywall construction, provide noise and vibration isolation of mechanical system penetrations as follows:
   a. Annular space shall be 1” larger than scheduled pipe or duct passing through the wall and shall be packed and sealed as described above.
   b. Each penetration must be individually sealed; multiple pipes routed through a single opening are not acceptable unless specifically detailed.

3. Where sleeved penetrations are required in concrete or masonry construction:
   a. Provide sleeves of 22-gauge-minimum steel, grouted rigidly in place and airtight, for all duct, pipe, conduit, and other penetrations through walls, ceilings, and floors of mechanical equipment rooms, dimmer rooms, transformer rooms, main switchgear rooms and where noted on drawings.
   b. Each penetration must be individually sealed; mass penetrations are not acceptable unless specifically detailed on the Contract Documents.
   c. Inside dimension of sleeve shall be no less than 1” greater than outside dimension of penetrating item on all sides.
   d. Pack annular space to full depth of penetration with clean fiberglass batt or blanket material flush to ends of sleeve.
   e. Seal full perimeter of both ends of sleeve with acoustic sealant to minimum 1/2” depth to achieve airtight seal.

END OF SECTION 079205
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 hollow-metal work.
   B. Related Requirements:
      1. Section 083473 STC Doors
      2. Section 083474 Non-STC Rated Sound Control Doors where doors labeled with G1, G2, G3, G4
      3. Section 087100 “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.

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, and finishes.
   B. 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 anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:
1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.

D. Schedule: Provide a schedule of hollow-metal work 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. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.
   1. Hollow metal doors.
   2. Hollow metal frames.

C. Low-Emitting Materials - Paints and Coatings: Include manufacturer’s printed statement of VOC content in g/l and Material Safety Data Sheet for each coating applied with weather barrier.
   1. Provide quantity take offs for each coating applied within weather barrier.

D. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

E. Minutes of preinstallation conference.

1.8 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Paints and Coatings: Provide quantity of each interior finish coating, paint, and primer used.

1.9 QUALITY ASSURANCE


1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work 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 work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch 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 Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Pioneer Industries, Inc.
4. Republic Doors and Frames.
5. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. 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 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.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. At all locations unless otherwise indicated.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Kraft-paper honeycomb or Polystyrene.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
   b. Construction: Full profile welded.

   1. Physical Performance:  Level A according to SDI A250.4.
   2. Doors:
      a. Type:  As indicated in the Door and Frame Schedule.
      c. Face:  Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.053 inch.
      d. Edge Construction:Model 2, Seamless.
      e. Core:  Kraft-paper honeycomb or Polystyrene.
   3. Frames:
      a. Materials:  Metallic-coated, steel sheet, minimum thickness of 0.053 inch.
      b. Construction:  Full profile welded.

2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Stud-Wall Type:  Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
   2. Postinstalled Expansion Type for In-Place Concrete or Masonry:  Minimum 3/8-inch-diameter bolts with expansion shields or inserts.  Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors:  Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
   1. Monolithic Concrete Slabs:  Clip-type anchors, with two holes to receive fasteners.

2.5 MATERIALS

A. Recycled Content of Steel Products:  Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet:  ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet:  ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet:  ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors:  ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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.

F. Inserts, Bolts, and Fasteners:  Hot-dip galvanized according to ASTM A 153/A 153M.

G. 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.
H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.6 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. 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.

B. Hollow-Metal Doors:

1. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
3. Top Edge Closures: Close top edges of doors with inverted closures of same material as face sheets.
4. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
5. 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 beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
3. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
      1) Three anchors per jamb up to 60 inches high.
      2) Four anchors per jamb from 60 to 90 inches high.
      3) Five anchors per jamb from 90 to 96 inches high.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
   b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
5. Door Silencers: Except on weather-striped 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.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; 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 applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   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.
   4. Provide loose stops and moldings on inside of hollow-metal work.
   5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 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.

2.8 ACCESSORIES

A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

   1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.

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. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame 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 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. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer’s written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

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. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install frames with removable stops located on secure side of opening.
   d. Install door silencers in frames before grouting.
   e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
   f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
   g. Field apply bituminous coating to backs of frames that will be filled with grout 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 power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.


4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:
   a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
   b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
   c. At Bottom of Door to Top of Threshold or Finished Floor: 3/8 inch maximum.
   d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

3.5 INSPECTION

A. Notify and coordinate review of completed installation of rated assemblies with the owner’s representative as part of building commissioning.

END OF SECTION 081113
SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Solid-core doors with wood-veneer faces.
   2. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:
   1. Section 081113 "Hollow Metal Doors and Frames" for frames.
   2. Section 083473 "Sound Control Door Assemblies" for acoustic flush wood doors.
   3. Section 083474 "Non-STC Rated Sound Control Doors" where doors labeled with G1, G2, G3, G4
   4. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; 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.

C. Samples for Verification:

   1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
   2. Louver blade and frame sections, 6 inches long, for each material and finish specified.
   3. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.
B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

   1. Flush wood doors.

C. Certified Wood: For certified wood and wood products provide documentation of certified status of forest. Documentation to contain supplier's Chain of Custody number, identify each certified product, and manufacturer on line item basis. Provide percentage and cost of each certified wood component. Submit vendor's invoice for certified wood and wood products.

D. Low-Emitting Materials - Composite Wood and Agrifiber Products: Manufacturer's certificate for each composite wood or agrifiber indicating no added urea-formaldehyde resin.

E. Sample Warranty: For special warranty.

F. Quality Standard Compliance Certificates: [AWI Quality Certification] [WI Certified Compliance] Program certificates.

G. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body and is a certified participant in AWI's Quality Certification Program.

B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

C. Certified Wood: Provide wood and wood products produced from wood obtained from forests certified by FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

   1. Flush wood doors.

D. Low-Emitting Materials - Composite Wood and Agrifiber Products: Manufacturer's certificate for each composite wood or agrifiber indicating no added urea-formaldehyde resin and each adhesive used in fabrication indicating containing no urea-formaldehyde.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in [plastic bags or cardboard cartons] [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 temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent 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 in a 42-by-84-inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.


PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   1. Algoma Hardwoods, Inc.
   2. Eggers Industries.
   3. Graham Wood Doors; an Assa Abloy Group company.
   5. Oshkosh Door Company.
   6. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S.1-A, "Architectural Wood Flush Doors."

1. Provide AWI Quality Certification Labels indicating that doors comply with requirements of grades specified.

B. Particleboard-Core Doors:

   1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
   2. Particleboard: Straw-based particleboard complying with ANSI A208.1, Grade LD-2 or M-2, except for density.
   3. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
   4. Provide doors with structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Structural-Composite-Lumber-Core Doors:


      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.
2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
   1. Grade: Premium, with Grade A faces.
   2. Species: White Oak
   3. Cut: Rift cut
   5. Assembly of Veneer Leaves on Door Faces: Center-balance match.
   6. Pair and Set Match: Provide for doors hung in same opening.
   7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
   8. Transom Match: Continuous match.
   9. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064023 "Interior Architectural Woodwork".
   10. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A Same species as faces - edge Type B Applied wood veneer edges of same species as faces and covering edges of faces - edge Type D.
   11. Core: Either glued wood stave or structural composite lumber.
   12. Construction: Seven plies, either bonded or nonbonded construction.

2.4 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. 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 088000 "Glazing."

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
   1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:
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 7100 "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 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 081416
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. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 288 for fire-rated access door assemblies installed horizontally.
2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
4. Cendrex Inc.
7. Milcor Inc.
8. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Concealed Flanges (AP-1):

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum board beads for concealed flange installation.
2. Locations: Wall and ceiling.
3. Door Size: 24 inches by 24 inches.
4. Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch, 16 gage.
5. Frame Material: Same material and thickness as door.
6. Hinges: Manufacturer’s standard.

D. Acoustical, Flush Access Door (AP2 and AP4)

1. Basis-of-Design Product: Bauco-Plus II
2. Assembly Description: Fabricate door to fit flush to frame, with a core of gypsum board enclosed in sheet metal. Provide concealed mechanical touch-latch door with lift-out doors with safety cables. Provide frame with continuous perimeter concealed gasket.
3. Locations: Required in any wall or ceiling noted as acoustically sensitive by the AC Drawings.
4. Door Size:
   a. 48 x 48 inches [AP2]
   b. 24 x 24 inches [AP4]
5. STC 34 in 5/8” gypsum board
6. Frame Material: Manufacturer’s standard
8. Lock: optional keyed lock

E. Fire-Rated, Flush Access Doors with Concealed Flanges (AP3):

1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide frame with beads for concealed flange installation.
2. Door Size: 24” x 24 inches
3. Locations: Wall and ceiling.
4. Fire-Resistance Rating: Not less than that indicated.
5. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
6. Metallic-Coated Steel Sheet for Door: Nominal 0.040 inch, 20 gage.

7. Frame Material: Same material, thickness, and finish as door.


2.3 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.
   1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   2. Provide mounting holes in frames for attachment of units to metal or wood framing.
   3. Provide mounting holes in frame for attachment of masonry anchors.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:
   1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
PART 3 - EXECUTION

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

3.2 INSTALLATION
   A. Comply with manufacturer's written instructions for installing access doors and frames.
   B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING
   A. Adjust doors and hardware, after installation, for proper operation.
   B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 INSPECTION
   A. Notify and coordinate review of completed installation of rated assemblies with the owner's representative as part of building commissioning.

END OF SECTION 083113
SECTION 083473 – SOUND CONTROL DOORS – STC RATED – SWING AND SLIDING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. The Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

A. Door highlighted as STC Sound Control Door labeled “S1 or S2” on the door schedule.

B. Sliding STC Sound Control Glass Door.

C. The Work of this Section includes all labor, materials, equipment, and services necessary to provide STC-Rated Sound Control Door and frame assemblies where shown on the Drawings, as specified herein, and listed on the Door Schedule. Door assemblies shall be primed for field painting or prefinished and shipped complete as one unit. Work includes but is not limited to:

1. Door leaf and frame factory-assembled, complete with acoustic seals, cam-lift hinges, and finish hardware.

1.3 RELATED SECTIONS

A. Concrete Unit Masonry – Section 4.

B. Wood Paneling and Grilles – Section 064216

C. Glass and Glazing – Section 8.

D. Hardware – Section 8.

E. Metal Support Assemblies and Gypsum Board – Section 9.

F. Painting – Section 9.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer’s data, shop drawings, and product performance certification through Architect to Acoustics Consultant in accordance with General Conditions

1. Submit manufacturer’s technical product data substantiating that products comply with requirements.

2. Provide illustrations and descriptions of components including but not limited to seals, hardware, jamb anchors, thresholds, and sweeps.

3. Provide to the Owner through Architect and Acoustic Consultant, full operation and maintenance instructions for the door assembly.

B. Shop Drawings:

1. Provide full size details of frames showing head and jamb conditions and sound gasket components.

2. Provide installation details applicable to substrate in which STC-Rated Sound Control Doors and frames will be installed.

3. Indicate construction, sizes, thicknesses, reinforcing, anchoring, and finishes of materials.

4. Provide schedule of STC-Rated Sound Control Doors and frames using the same reference numbers for details and openings as those indicated on the Drawings. Indicate on schedule fire-rated STC-Rated Sound Control Doors, frames and hardware.

C. Certification:

1. Provide certified laboratory test reports from an independent acoustics laboratory showing that a fully operating installation of the specific STC-Rated Sound Control Door assembly proposed for installation has been measured in accordance with ASTM E 90-99. Test reports shall certify that the final assembly has met or exceeded the scheduled STC ratings and is not more than 5 years old. If test data is not available from within the required time frame, then the manufacturer shall provide certification in writing that the materials and fabrication process have not changed since the last test.

2. Provide written reports of at least two acoustic field tests showing that comparable installations have been measured in excess of a Noise Isolation Class (NIC) which is not more than 6 points below specified STC rating following procedures set forth in ASTM E 336 97.

3. For Fire-rated STC-Rated Sound Control Doors provide certified laboratory test reports attesting that final assembly complies with requirements as specified and as indicated on the Drawings.

1.5 QUALITY ASSURANCE

A. Provide STC-Rated Sound Control Doors including acoustic seals, gaskets, hinges and other hardware items essential for sound control. Provide door assembly from single firm with experience in producing this type of work for a minimum of ten (10) years.

B. Acoustic Performance:

1. Acoustic door manufacturer shall submit acoustic performance data in the form of up-to-date test reports from an independent testing laboratory indicating that doors provided will have required Sound Transmission Class Rating: ASTM E-90-99.

2. Gasket system shall provide airtight seal around entire perimeter of door when closed. Effort to compress seal shall not exceed 20 pounds pressure applied to lockset.

3. Bottom of door leaf shall contain continuous, adjustable, fixed compression or gravity-activated compression seal that shall compress against floor as door is closed. Raised sills and threshold drop seals will not be acceptable.

4. Repair or replace deficient components without cost to Owner.

C. Swing Door: The weight of each door shall not be less than 7 pounds per square foot.

<table>
<thead>
<tr>
<th>DOOR TYPE</th>
<th>STC</th>
<th>Min. THICKNESS</th>
<th>Min. WEIGHT (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 - Swing</td>
<td>48-49</td>
<td>2-1/2'</td>
<td>7</td>
</tr>
<tr>
<td>S2 - Swing</td>
<td>54</td>
<td>2-1/2'</td>
<td>11</td>
</tr>
</tbody>
</table>
D. Sliding Glass Door:

<table>
<thead>
<tr>
<th>DOOR TYPE</th>
<th>STC</th>
<th>Min. Glass THICKNESS</th>
<th>Min. WEIGHT (PSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 - Swing</td>
<td>46</td>
<td>3/4&quot;</td>
<td>Per manufacturer</td>
</tr>
</tbody>
</table>

E. STC-Rated Sound Control Door manufacturer shall provide field supervision or may provide technical assistance with periodic field observation of door installation. Submit supervision plan in writing through Architect to Acoustic Consultant for review.

F. Swing Mock-ups: Prior to installation of STC-Rated Sound Control Doors, install one door ahead of schedule or “mock-up” installation of typical door, frame, and adjacent wall construction at location on site mutually agreed upon by Architect, Acoustics Consultant, Owner and Contractor. Include in mock-up materials, details, accessories, and techniques that will be used in actual construction of door and adjacent wall. Acoustic Consultant shall review mock-up installation. Make changes or corrections as directed by Acoustic Consultant. After final review of mock-up, retain and use as standard of quality and workmanship for actual STC-Rated Sound Control Door installation.

1.6 REFERENCES

A. This work is subject to:


1.7 SYSTEM PERFORMANCE REQUIREMENTS

A. The STC-Rated Sound Control Doors shall comply with applicable local, state, and federal codes including the Americans with Disabilities Act.

B. Sound Control Doors and frames shall comply with sound transmission class performance as noted in the door schedule.

C. Sound Rating: Door and frame assemblies, fabricated for sound attenuation shall be tested according to ASTM E 90, comply with ASTM E 413, and have certified Sound Transmission Class (STC) rating as indicated on drawings.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Wrapping: Deliver door assemblies palletized, wrapped, or crated to provide protection during transit and storage.

B. Inspection: Inspect door assemblies upon delivery for damage. Minor damages may be repaired provided finish items are equal in all respects to original work; otherwise replace damaged items.

C. Storage: Store door assemblies at building site under cover and stacked per manufacturer’s direction so as to prevent damage to the door or the acoustic seal.
1.9 WARRANTY

A. General Warranty: Door assemblies shall be warranted against defective workmanship, operation, and materials.

B. Warranty Period: At least two (2) years from date of final acceptance.

PART 2 - PRODUCTS

2.1 STC RATED SOUND CONTROL DOORS

A. Material Composition: As follows:

1. Metal Door leaf: Minimum thickness as shown on Contract Documents. Fabricate door leaf(s) and door stiffeners from 14-gauge (2 mm) cold rolled steel, and fill with 6 lb density sound absorbing and damping materials.

2. Frame(s): Fabricated from 14-gauge cold rolled steel that is mitered and welded together.

3. Acoustic seals: Shall be continuous at head, jamb, meeting stiles of double doors, self-aligning magnetic [fire resistant (if UL rated)] or compression seals, or a combination of both magnetic and compression, to provide performance as specified in table below. Provide continuous neoprene sweep, fixed compression, or gravity-activated compression seals at sill. Under no circumstances will automatic door bottoms be acceptable. Acoustic seals Door(s) shall be held in closed position by magnetic force of perimeter seals.

4. Glass & Glazing: Where indicated on Drawings, provide manufacturer’s standard sound-control glazing system, factory assembled, in vibration-isolated frame with concealed stops and mounting hardware. Provide fire-resistant glass to meet UL ratings as indicated on Door Schedule and on Drawings. Note to Architect: Coordinate glazing of STC-rated sound control doors with required fire-rated openings.

5. Inserts, Bolts & Fasteners: Manufacturer’s standard units, except hot-dip galvanized items to be built into exterior walls and complying with ASTM A-153, Class C or D as applicable.

6. Hardware: Cam-lift hinges, sound-control seals and thresholds shall comply with applicable sound control performance standards. Note to Architect: Coordinate hold-opens with hardware schedule for these doors. Any use of door wedges to keep doors open will damage seals at the sill and impede acoustic performance of door assembly.

B. Approved manufacturers:

1. Security Metal Products 5678 Concours St., Ontario, CA 91764 Telephone 909/593-2100, website www.secmet.com


3. Overly Manufacturing Co., 574 W. Otterman Street, Greensburg, PA 15601 0070. Telephone 412/834 7300, facsimile 412/830 2871, website www.overly.com

4. Jamison Door Co., P.O. Box 70, Hagerstown, MD 21741. Telephone 800/532 3667, facsimile 301/791-7339, website www.jamison-door.com

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and surrounding conditions to receive work specified herein. Verify dimensions of inplace and subsequent construction. Application or installation of materials constitutes acceptance of the adjacent and underlying construction.

3.2 INSTALLATION

A. Install items plumb (or as indicated on the contract documents), straight, square, level, and in their proper elevation, plane, and location.

B. Fully grout jambs by trowel or injection method.

C. Install and adjust seals and gaskets to achieve airtight acoustic seal around entire perimeter of each door panel.

D. Install and adjust hardware and hinges in accordance with performance requirements and in compliance with local, state, and federal codes.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing:

1. Kirkegaard Associates will perform acoustic performance testing during punchlist of a few select doors before acceptance of installed STC-Rated Sound Control Door assemblies.

2. Installations shall be deemed acceptable if STC-Rated Sound Control Door assemblies meet or exceed Noise Isolation Class (NIC) which is not more than 6 points below specified STC rating. Conduct measurements in accordance with procedures set forth in ASTM E 336 97 with exceptions and additions as follows:
   a. With reference to test procedures noted in ASTM E336 97, microphone positions may be spaced as close as 0.5 m (approx. 1’ 8") on center. Project Acoustics Consultant shall locate microphones and note in field test report. Follow other procedures specified in ASTM E336 97 related to microphone positions.
   b. Project Acoustics Consultant shall review field conditions and room geometry and shall direct test procedure based on existing conditions. Document test conditions and procedures in field test report.

B. Diagnostic Testing and Remediation:

1. If results of first sets of test data fail to meet required performance, perform additional diagnostic testing to ascertain source(s) of sound transmission.

2. Diagnostic field tests shall be conducted as follows:
   a. Scan acoustic seals and gaskets while broad band noise source (as described in ASTM E336 97) is operating on opposite side of STC-Rated - Sound Control Door assembly. Contractor, with manufacturer oversight, shall adjust seals and gaskets if necessary so that A scale values at 6 inches from seals are not more than 4 dB greater than A scale values measured 6 inches away from center of door.
   b. Conduct tests of flanking construction if perimeter gaskets pass, or are adjusted to pass. If scanning test and specified NIC value is still not achieved, tape acoustic seals and gaskets using special adhesive tape as designated by Project Acoustics Consultant.
If taped assembly achieves specified NIC value, installing Contractor shall provide additional adjustments and modifications necessary to meet specified NIC value for fully operating assembly.

d. If taped assembly does not yield specified NIC value, flanking construction paths, door panel deficiency, or both may be responsible. If, when judged by Project Acoustics Consultant, there is no unequivocal indication whether flanking construction path or door panel deficiency is probable cause, conduct checks for flanking transmission using supplemental door panel barrier as described in ASTM E 336 97, Annex A2.

e. If flanking transmission is revealed, take appropriate corrective measures to eliminate flanking transmission. Surrounding construction shall be deemed satisfactory when specified NIC value has been met with supplemental panel barrier in place over door.

f. If specified NIC value is no longer met after removing supplemental panel barrier, then STC-Rated Sound Control Door panel deficiencies and/or some other fault directly associated with door assembly are indicated as cause of unsatisfactory performance. Contractor shall provide corrective modifications to operating STC-Rated Sound Control Door assembly and shall conduct subsequent tests until the STC-Rated Sound Control Doors meet specified performance requirements.

C. Reports: Submit through Architect to Acoustics Consultant a final report documenting test results including test procedures and microphone layout. Provide full documentation of corrective measures taken to bring door assemblies into compliance with performance requirements. Submit through Architect to Owner complete set of operating and maintenance instructions for door system and copy of system warranty.

3.4 CLEANING, PROTECTING, AND REPAIR

A. Check and readjust finished hardware items immediately prior to final inspection. Leave finished work clean, complete and in proper operating condition for Architect and Acoustics Consultant to review prior to final acceptance. Remove and replace defective work, including doors and frames, which are bowed, warped, or otherwise unacceptable.

B. After installation and prior to acceptance testing, provide letter through Architect to Acoustics Consultant indicating that STC-Rated Sound Control Door assemblies have been completely installed and gaskets have been adjusted to form airtight acoustic seals around the full perimeter of each door panel.

END OF SECTION 083473
SECTION 083474 – NON-STC RATED SOUND CONTROL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide sound-control door and frame assemblies where indicated on the Door Schedule by G1, G2, G3, G4 gasket label. Work includes but is not limited to door leaf and frame, seals, and mounting hardware.

1. Related Work
2. Cast-in-Place Concrete
3. Concrete Unit Masonry
4. Hollow Metal Door and Frame
5. Hardware
6. Metal Stud Framing & Gypsum Wallboard
7. Painting

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. The Sound-Control Doors shall comply with applicable local, state, and federal codes including the Americans with Disabilities Act.

B. Gasket system shall provide airtight seal around entire perimeter of door when closed. Effort required to compress seal shall comply with ADA and applicable regulations.

C. The surface weight of each door shall not be less than 7 psf.

1.3 WARRANTY

A. Door assemblies shall be warranted against defective workmanship, operation, and materials for period of at least two years from date of final acceptance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Solid Core Wood: Staved or particle board only, no mineral core.

1. Eggers Industries, P.O. Box 1050, Neenah, WI 54957-1050; telephone: 920/722-6444, facsimile: 920/722-0357, website www.eggers.com *

2. Krieger Products, 233 Bonsall Rd, #2, Coatesville, PA 19320; telephone: 562/695-0645, website www.kriegerproducts.com*
3. Marshfield Doors, 1401 East Fourth Street, Marshfield, WI 54449; telephone: 800/869-3667, website www.marshfielddoors.com *

4. Approved equal

* Staved or particle or particle board only

B. Hollow Metal: Mineral Fiber Filled. 16 gauge door panels shall be supplied

1. Amweld Building Products, Inc.; Garrettsville, OH; Telephone: (330) 527-4385.
   a. Series 500: 16ga and 18ga available
   b. Series 700 – 14, 16, 18,ga available as well as lead-lined.

2. Curries Company; Mason City, IA; telephone: (641) 423-1334.
   a. 747 Series

3. Mesker, 3440 Stanwood Boulevard, Huntsville, AL 35811; telephone: 256.851.6670, website: www.meskerdoor.com
   a. Steel Stiffened Door

4. Approved equal

C. Door Seals and Gaskets

1. Zero International Inc.; Bronx, NY; Telephone: (800) 635-5335.

2. Pemko Manufacturing Co.; Memphis, TN; Telephone: (800) 824-3018.

3. National Guard Products; Memphis, TN; Telephone: (800) 647-7874

2.2 MATERIALS

A. Metal Frame: Fabricated from minimum 16 gauge cold rolled steel, mitered, and welded.

1. Head and jamb to be packed with rockwool or glassfiber.

B. Wood Frames: Solid timber frames with solid blocking behind.

1. At new or existing openings, jamb may be packed with rockwool or glassfiber.

C. Doors shall be primed for field painting or prefinished.

D. Acoustic seals: Continuous neoprene compression seals to be provided at head, jamb, and meeting stiles of double doors. Continuous neoprene sweep, fixed compression, or gravity-activated compression seals at sill. Under no circumstances will automatic door bottoms be acceptable. Please note: Any use of wedges to keep doors open will damage seals at the sill and impede acoustic performance of door assembly.

1. Below are the referenced acoustical gasket sets. Reference details on A014 for further information:

Type G1 BASIC GASKETED DOOR
NOT USED
TYPE G2 acoustical gaskets: 1 set of neoprene compression adjustable gasket screwed to door frame at head and jambs. Silicone “T” overlap gasket at astragal/meeting stiles. Furnish raised or saddle thresholds and surface mounted neoprene sweep seal at door bottom. Furnish hollow metal doors with recess at the door bottom or solid core wood doors with a routed bottom. Fill recess or routing at door bottom with glass fiber or felt strip.

<table>
<thead>
<tr>
<th>Gasket Types</th>
<th>Zero</th>
<th>Pemko</th>
<th>NGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head / Jamb Seals (1 set)</td>
<td>570</td>
<td>322N</td>
<td>104N</td>
</tr>
<tr>
<td>Astragal/Meeting Stiles</td>
<td>383</td>
<td>355S</td>
<td>158S</td>
</tr>
<tr>
<td>Threshold</td>
<td>164</td>
<td>151</td>
<td>412</td>
</tr>
<tr>
<td>Door Bottom</td>
<td>39</td>
<td>315N</td>
<td>200N</td>
</tr>
</tbody>
</table>

Door Bottom Fill recess at hollow metal door bottom with glass fiber or routing at solid core door with ¼" thick F-1 or F-3 felt strip per A014 details.

Closers on all G2 doors shall have an extension arm so as not to interrupt head gasket.

TYPE G3 acoustical gaskets: Felt strip insert into kerfed wood or metal frame and 1 set of silicone compression self adhesive bubble type gaskets at head and jambs. Silicone “T” overlap gasket at astragal/meeting stiles. Furnish cam lift hinges and no raised thresholds. Surface mounted neoprene sweep seal at door bottom. Furnish hollow metal doors with recess at the door bottom or solid core wood doors with a routed bottom. Fill recess or routing at door bottom with glass fiber or felt strip.

<table>
<thead>
<tr>
<th>Gasket Types</th>
<th>Zero</th>
<th>Pemko</th>
<th>NGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head / Jamb Seals (1 set)</td>
<td>¼&quot;</td>
<td>S88</td>
<td>5050</td>
</tr>
<tr>
<td>Astragal/Meeting Stiles</td>
<td>36</td>
<td>354S</td>
<td>144S</td>
</tr>
<tr>
<td>Threshold</td>
<td>No Raised Threshold</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door Bottom</td>
<td>39</td>
<td>315N</td>
<td>200N</td>
</tr>
</tbody>
</table>

Door Bottom Fill recess at hollow metal door bottom with glass fiber or routing at solid core door with ¼" thick F-1 or F-3 felt strip per per A014 details.

Cam Lift Hinges             Z950  Acceptable Alternate Proposed
TYPE G4 acoustical gaskets: Felt strip insert into kerfed wood and metal frame and 1 set of silicone compression self adhesive bubble type gaskets at head and jambs. No raised threshold. Sound trap detail at door bottom and astragal.

<table>
<thead>
<tr>
<th>Gasket Types</th>
<th>Zero</th>
<th>Pemko</th>
<th>NGP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head / Jamb Seals (1 set)</td>
<td>¼&quot; thick F-1 felt strip insert into kerfed frame.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head / Jamb Seals (1 set)</td>
<td>188S</td>
<td>S88</td>
<td>5050</td>
</tr>
<tr>
<td>Astragal/Meeting Stiles</td>
<td>Sound Trap Detail (See door details)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>As shown on drawings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Door Bottom</td>
<td>Sound Trap Detail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a. Sound Trap Detail Construction: Route out 1” x 1” door bottom and at double door astragal. Insert metal “C” channel either glued or screwed. Stuff cavity with glass fiber. Covered with powder coated 50% open perforated metal sheets. Reference Details on A014</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Automatic door bottoms not permitted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Gasket system shall provide airtight seal around entire perimeter of door when closed. Effort required to compress seal shall comply with ADA and applicable regulations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Color of gaskets and felt inserts as specified by Architect.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine substrate and surrounding conditions to receive work specified herein. Verify dimensions of in place and subsequent construction. Application or installation of materials constitutes acceptance of the adjacent and underlying construction.

3.2 INSTALLATION

A. Install items plumb (or as indicated on the contract documents), straight, square, level, and in their proper elevation, plane, and location.

B. Head and jamb to be packed with rockwool or glassfiber.

C. Where thresholds are indicated, fully grout by trowel or injection method, or resiliently seal at both edges.

D. Install and adjust seals and gaskets to achieve continuous contact around entire perimeter of each door panel. Gaps and dimples between door surface and seal are unacceptable.

E. Install and adjust hardware and hinges in accordance with performance requirements and in compliance with local, state, and federal codes.

3.3 ADJUST AND CLEAN

A. Check and readjust finish hardware items immediately prior to final inspection. Leave finished work clean, complete, and in proper operating condition for Architect and Acoustics Consultant to review prior to final acceptance. Remove and replace defective work, including doors and frames, which are bowed, warped, or otherwise unacceptable.
B. After installation and prior to acceptance testing, provide letter through Architect to Acoustics Consultant indicating that Sound Control Door assemblies have been completely installed and gaskets have been adjusted to form airtight acoustic seals around the full perimeter of each door panel.

END OF SECTION 083474
SECTION 084413 - 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.
   B. Related Sections:
      1. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashings installed with curtain wall assemblies.
      2. Section 079200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this section.
      4. Section 087100 "Door Hardware" for hardware to the extent not specified in this Section, including locksets and cylinders.
      5. Section 088000 "Glazing" for glass types installed in curtain wall framing systems.

1.3 PREINSTALLATION MEETINGS
   A. Preinstallation Conference: Conduct conference at Project site Review methods and procedures related to curtain wall systems including, but not limited to, the following:
      1. Meet with Owner, Architect, testing and inspecting agency representative, curtain wall manufacturer's local technical representative and installer, cladding installer, sheetmetal installer and installers whose work interfaces with or affects curtain wall assemblies.
      2. Review methods and procedures related to curtain wall 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. Review curtain wall surface cleaning and preparation requirements for new sealant transition assembly and flashing locations.
      5. Review, discuss, and coordinate the interrelationship of aluminum curtain walls other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
      6. Review and discuss the sequence of work required to construct a watertight and weather tight exterior building envelope.
      7. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
      8. Review field inspection and testing requirements.
1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   1. Include construction details, material descriptions, dimensions of individual components and
      profiles, and finishes.

B. 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.
   4. Submit only project specific details that have been reviewed and approved by the curtainwall
      manufacturer. Manufacturer's standard details are not acceptable.

C. Manufacturer's Review: Product data sheets and shop drawings shall be submitted to the curtain wall
   manufacturer who will then review, accept, provide a cover letter of acceptance to be provided as part of
   the submittal.

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. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. 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.

B. Thermal Performance Modeling: Submit thermal performance modeling indicated as part of Performance
   Requirements article below.

C. Qualification Data: For Installer and field testing agency.
   1. In addition to experience qualification information provide a list of projects of similar nature by
      installer that have been installed during last five (5) years.

D. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer
   recycled content by weight and pre-consumer recycled content by weight for each Product specified under
   this Section. Document material cost of each Product.

E. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted,
   harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost
   of each Product.
F. Low-Emitting Materials - Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior sealant and sealant primer used inside weatherproofing system.
   1. Provide quantity take offs for each sealant, and sealant primer.

G. 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.

H. Product Test Reports: For glazed aluminum curtain walls, for tests performed by a qualified testing agency.

I. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

J. Source quality-control reports.

K. Field quality-control reports.
   1. Submit reports to Owner and Architect within five (5) working days of each site visit.

L. Minutes of preinstallation conference.

M. Warranties: Submit copies conforming to warranty requirements of this Section stating all obligations, remedies, limitations, and exclusions.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

B. Low-Emitting Materials - Sealants: Provide quantity of each interior sealant and sealant primer used inside weatherproofing system.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
   1. An installer having at least five (5) years previous successful experience installing curtain wall systems of the types specified for this Project and being familiar with special requirements indicated.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Low-Emitting Materials - Sealants: Use sealants and sealant primers inside weatherproofing system that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:
   1. Architectural Sealants: 250 g/L.
   2. Architectural Non-porous Sealant Primers: 250 g/l.
   3. Architectural Porous Sealant Primers: 775 g/l.
D. 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. Performance characteristics indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance. Prescriptive characteristics are as specified.

1. Do not revise intended aesthetic effects and design performance requirements, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review prior to bid.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. All materials and submittals materials that constitute the mockup must be submitted and approved prior to mockup construction.
2. Build free standing integrated mockup of the exterior wall assembly at the location shown on Drawings or if not shown at a location directed by the Architect, incorporating foundation wall assemblies, precast wall assemblies, curtain wall air barriers curtainwall (ETA) glazing accessories, and glazing assemblies, flashings, closures, trim and sealants.
   a. Include typical components, attachments to building structure, and methods of installation.
3. Prepare mockup for inspection and testing requirements: Mockups are to be reviewed and tested in phases or stages of completion. For example: precast cladding installation and joint sealing is to be reviewed prior to installation of curtainwall and glazing assemblies and joint sealants. Coordinate phasing for each mockup type with Architect and Owner.
4. Testing may be performed on mockups according to requirements in "Field Quality Control" Article.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls 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, metal finishes, and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
2. Warranty Period: Ten (10) 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: Twenty (20) years from date of Substantial Completion.

1.10 COORDINATION

A. Provide metal flashings, trims and closures as part of these systems and in coordination with section 076200 "Sheet Metal Flashing and Trim." Finish as indicated in this specification section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, licensed to practice in Missouri to design glazed aluminum curtain walls.

B. 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.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
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 for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. 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.

F. 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. at a static-air-pressure differential of 6.24 lbf/sq. ft.

G. 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.

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:
   1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
   2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.
   1. Design Displacement: As indicated on Structural Drawings.
   2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
   1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
   2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:
   1. Performance values shown are the minimum values required.
      a. Tested in accordance with AAMA 1503*, AAMA 507, and NFRC 100 based on 1 inch clear high performance insulating glass, 1/4 Clear (E=0.040 #2), 1/2, Air Space, 1/4, Clear, having a center of glass, U-factor of 0.29 BTU/HR/FT²/°F with an NFRC U-factor of 0.37 BTU/HR/FT²/°F.
   2. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.37 Btu/sq. ft. x h x deg F Insert value as determined according to NFRC 100.
   3. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 27 as determined according to NFRC 200.
   4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 78 as determined according to NFRC 500.
a. Provide thermal performance modeling simulations of glazing systems, demonstrating that the coldest point on the interior surface temperature of the system (frame and glass) shall be maintained at not less than 46°F at the design-low conditions of -1°F exterior and 64°F interior, to be established by 2D thermal modeling of an intermediate horizontal mullion, incorporating scheduled Glass Type IG-1 specified in section 088000 "Glazing."•

1) Modeling Software: Window 7.4 and Therm 7.4
2) Perform simulations in accordance with NFRC 100 procedures with the exception of the unit sizes used.
3) Unit sizes: 78.74 inches x 78.74 inches; Area 43.06 ft. sq.
4) Tilt: 90.
5) Environmental conditions NFRC 100-2010.

L. Noise Reduction: Test according to AAMA 1801, ASTM E 90, with ratings determined by ASTM E 1332, as follows:


M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.

b. Low Exterior Ambient-Air Temperature: 0 deg F.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Named systems by YKK AP America, Inc., or comparable product by one of the following:

1. Kawneer North America; an Alcoa company.
2. Oldcastle, Inc.

B. Source Limitations: Obtain all components of curtain wall system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Framing System [Type-1]: Basis of Design, YKK AP America, Inc., Model YCW 750 XTIG.


b. Glazing System: Retained mechanically with gaskets on four sides.

c. Framing Size: 2-1/2 to 3 inch maximum face x 8 inch mullion profiles; pressure glazed, front set, interior glazed.

1) System is to be custom modified to receive scheduled glass thickness and sizes
2) Thermal Barrier: Provide continuous thermal barrier by means of 6/6 nylon polyamide glass fiber reinforced pressure extruded bars. Systems employing non-structural thermal barriers are not acceptable.
3) Face Cap: Integral Cover.

d. Glazing Plane: Front.
f. Fabrication Method: Either factory- fabricated system Field-fabricated stick system.

2. Framing System [Type-2]: Basis of Design, YKK AP America. Inc., Model YCW 750 XTP.
   b. Glazing System: Retained mechanically with gaskets on four sides.
   c. Framing Size: 2-1/2 inch face x 8 inch mullion profiles; pressure glazed, front set, exterior glazed.
      1) Thermal Barrier: Provide continuous thermal barrier by means of 6/6 nylon polyamide glass fiber reinforced pressure extruded bars. Systems employing non-structural thermal barriers are not acceptable.
      2) Pressure Plate: Low conductivity pressure plate.
      3) Face Cap: Standard.
      4) Provide internal structural steel reinforcement to meet loading requirements.
   d. Glazing Plane: Front.

3. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Entrance Door Jamb Profiles:
   1. Refer to specification section 084423 "Structural-Sealant-Glazed Curtain Walls" for door entrance specifications.

C. Materials:
   1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
      a. Sheet and Plate: ASTM B 209.
      b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
      c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
      d. Structural Profiles: ASTM B 308/B 308M.
      e. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
   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.

2.4 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

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

C. Glazing Sealants: As recommended by manufacturer.
D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.


2.5 SPANDREL PANELS

A. Spandrel Panels: Formed Aluminum flat panels.

1. Thickness: 0.05 inches.
   a. Finish: Matching framing system.
   b. Texture: Smooth.
   a. Provide support angles and framing to support spandrel panels to meet loading requirements.
   b. Materials: Aluminum as provided for the curtain wall system.

2.6 ACCESSORY MATERIALS

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM 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 thickness per coat.

E. Composite Shims:

1. Basis of Design: Korolath plastic shims.
2. Cut to fit bearing condition.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. 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 interior for vision glass and exterior for spandrel glazing or metal panels.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
7. Components curved to indicated radii.

C. Fabricate components to resist water penetration as follows:
   1. 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.

D. Curtain-Wall Framing: Fabricate components for assembly using shear-block system.

E. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

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 and accepted in writing by the installer.
   1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.
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 will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact 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 088000 “Glazing.”

1. 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.

F. Install weatherseal sealant according to Section 079200 “Joint Sealants” and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

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; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Test Area: Perform tests on one bay at least 30 feet, by one story and a minimum of 2 other representative areas of glazed aluminum curtain walls determined by the Owner and Architect.

1. Tests must include perimeter joints to wall construction.

C. Field Quality-Control Testing: Perform the following tests with manufacturer's representation present 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 tests in areas as directed by Architect.

2. Air Infiltration: ASTM E 783 not to exceed 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

   a. Perform a minimum of three tests in areas as directed by Architect.

3. Water Infiltration: ASTM E 1105 at a minimum static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

   a. Perform a minimum of three tests in areas as directed by Architect.

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 084413
SECTION 084423 - STRUCTURAL-SEALANT-GLAZED 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:
   1. Factory-glazed to cassettes, four-sided structural-sealant-glazed curtain-wall assemblies.

B. Related Sections:
   1. Section 076200 "Sheet Metal Flashing and Trim" for sheet metal flashings installed with curtain wall assemblies.
   2. Section 079200 "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls and for sealants to the extent not specified in this section.
   3. Section 084413 "Glazed Aluminum Curtain Walls" for conventionally glazed curtain walls.
   4. Section 087100 "Door Hardware" for hardware to the extent not specified in this Section, including locksets and cylinders.
   5. Section 088000 "Glazing" for glass types installed in curtain wall framing systems.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site. Review methods and procedures related to curtain wall systems including, but not limited to, the following:
   1. Meet with Owner, Architect, testing and inspecting agency representative, curtain wall manufacturer's local technical representative and installer, cladding installer, sheet metal installer and installers whose work interfaces with or affects curtain wall assemblies.
   2. Review methods and procedures related to curtain wall 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. Review curtain wall surface cleaning and preparation requirements for new sealant transition assembly and flashing locations.
   5. Review, discuss, and coordinate the interrelationship of aluminum curtain walls other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
   6. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   7. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.
   8. Review curtain wall field testing requirements.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For structural-sealant-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 structural-sealant-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.
4. Submit only project specific details that have been reviewed and approved by the curtain wall manufacturer. Manufacturer's standard details are not acceptable.

C. Manufacturer's Review: Product data sheets and shop drawings shall be submitted to the curtain wall manufacturer who will then review, accept, provide a cover letter of acceptance to be provided as part of the submittal.

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. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Delegated-Design Submittal: For structural-sealant-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.

B. Thermal Performance Modeling: Submit thermal performance modeling indicated as part of Performance Requirements article below.

C. Qualification Data: For Installer and field testing agency.

1. In addition to experience qualification information provide a list of projects of similar nature by installer that have been installed during last five (5) years.

D. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

E. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

F. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

1. Provide quantity take offs for each adhesive.
   1. Basis for Certification: NFRC-certified energy performance values for each structural-sealant-glazed aluminum curtain wall.

H. Product Test Reports: For structural-sealant-glazed aluminum curtain walls, for tests performed by a qualified testing agency.

I. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

J. Source quality-control reports.

K. Field quality-control reports.
   1. Submit reports to Owner and Architect within five (5) working days of each site visit.

L. Minutes of preinstallation conference.

M. Warranties: Submit copies conforming to warranty requirements of this Section stating all obligations, remedies, limitations, and exclusions.

1.6 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide quantity of each interior adhesive used inside weatherproofing system

B. Maintenance Data: For structural-sealant-glazed aluminum curtain walls to include in maintenance manuals.

C. Maintenance Data for Structural Sealant: For structural-sealant-glazed curtain walls 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.
   1. An installer having at least five (5) years previous successful experience installing curtain wall systems of the types specified for this Project and being familiar with special requirements indicated.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

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. Performance characteristics indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance. Prescriptive characteristics are as specified.
   1. Do not change intended aesthetic effects and design performance requirements, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review prior to bid.
D. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:
   1. Structural Glazing Adhesives: 100 g/L.

E. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of curtain-wall assemblies.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
   1. All materials and submittals materials that constitute the mockup must be submitted and approved prior to mockup construction.
   2. Build free standing integrated mockup of the exterior wall assembly at the location shown on Drawings or if not shown at a location directed by the Architect, incorporating: foundation wall assemblies, precast wall assemblies, curtain wall and glazing assemblies, flashings, closures, trim and sealants.
      a. Include typical components, attachments to building structure, and methods of installation.
   3. Prepare mockup for inspection and testing requirements: Mockups are to be reviewed and tested in phases or stages of completion. For example: precast cladding installation and joint sealing is to be reviewed prior to installation of curtainwall and glazing assemblies and joint sealants. Coordinate phasing for each mockup type with Architect and Owner.
   4. Testing may be performed on mockups according to requirements in "Field Quality Control" Article.
   5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   6. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of structural-sealant-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, metal finishes, and other materials beyond normal weathering.
      d. Water penetration through fixed glazing and framing areas.
   2. Warranty Period: Ten (10) 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: Twenty (20) years from date of Substantial Completion.

1.10 COORDINATION

A. Provide metal flashings, trims and closures as part of these systems and in coordination with section 076200 "Sheet Metal Flashing and Trim." Finish as indicated in this specification section.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design structural-sealant-glazed aluminum curtain walls.

B. General Performance: Comply with performance requirements specified, as determined by testing of structural-sealant-glazed curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Structural-sealant-glazed 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.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus 1/4 inch for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components to less than 1/8 inch.
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 for spans greater than 11 feet 8-1/4 inches or 1/175 times span, for spans less than 11 feet 8-1/4 inches.

E. 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.
F. 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. at a static-air-pressure differential of 6.24 lbf/sq. ft. 
   b. Entrance Doors:
      1) Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
      2) Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
      3) Provide compliance information for oversized doors:

G. 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.

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.
2. Maximum Water Leakage: No uncontrolled water penetrating assemblies or water appearing on assemblies normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Structural Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Structural-sealant-glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Performance values shown are the minimum values required.
   a. Tested in accordance with AAMA 1503*, AAMA 507, and NFRC 100 based on 1 clear high performance insulating glass, 1/4 Clear (E=0.040 #2), 1/2, Air Space, 1/4, Clear, having a center of glass, U-factor of 0.29 BTU/HR/FT²/°F with an NFRC U-factor of 0.37 BTU/HR/FT²/°F.
   b. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.36 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
   3. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 20.27 as determined according to NFRC 200.
   4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 80 as determined according to NFRC 500.
5. Thermal performance modeling for Glazed Wall Systems:
   a. Provide thermal performance modeling simulations of glazing systems, demonstrating that the coldest point on the interior surface temperature of the system (frame and glass) shall be maintained at not less than 46°F at the design-low conditions of -1°F exterior and 64°F interior, to be established by 2D thermal modeling of an intermediate horizontal mullion, incorporating scheduled Glass Type IG-1 specified in section 088000 "Glazing."•
   1) Modeling Software: Window 7.4 and Therm 7.4
   2) Perform simulations in accordance with NFRC 100 procedures with the exception of the unit sizes used.
   3) Unit sizes: 78.74 inches x 78.74 inches; Area 43.06 ft. sq.
   4) Tilt: 90.
   5) Environmental conditions NFRC 100-2010.

L. Noise Reduction: Test according to AAMA 1801, ASTM E 90, with ratings determined by ASTM E 1332, as follows:
   1. Outdoor-Indoor Transmission Class: Minimum 26 when shop glazed.
   2. Sound Transmission Class (STC): Minimum 33, when shop glazed.

M. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
   2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
   a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F
   b. Low Exterior Ambient-Air Temperature: 0 deg F.

N. Structural-Sealant Joints:
   1. Designed to produce tensile or shear stress of less than 20 psi.

O. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed curtain walls without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.
   1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
   2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant’s internal strength.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Named systems by YKK AP America, Inc. or comparable product by one of the following:
   1. Kawneer North America; an Alcoa company.
   2. Oldcastle, Inc.

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. Framing System [TYPE 3]: Basis of Design, YKK AP America, Inc., Model YCW 750 SSG

2. Glazing System: Retained with structural sealant on four sides; Shop Glaze, 4-Side Toggle.
   a. Framing Size: 2-1/2 inch face x 7-3/8 inch mullion profiles; pressure glazed, front set, exterior glazed.
   c. Fabrication Method: Factory-fabricated system of glass attached to cassettes and field built stick framing system.

3. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

B. Entrance Door Jamb Profiles: Provide applied perimeter door stops and a perimeter pressure plate to close off the pocket curtain wall framing pocket.

1. Finish to match curtain wall framing.

C. , frame profile with attachments to insert into curtain wall pocket.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   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.

2.4 ENTRANCE DOORS:

A. Manufacturer's heavy duty glazed entrance doors for manual-swing operation.

B. Basis of Design: Subject to compliance with requirements, provide YKK AP America, Inc., Model MegaTherm -XT Entrance Doors or comparable product by approved curtain wall system manufacturer.

1. Corner Construction: Fabricate door corners joined by concealed reinforcement secured with screws, and sigma deep penetration welding.

2. Door Design: Medium stile; 3.5-inch (127-mm) (88.9-mm) nominal width with 10 inch bottom rail.

3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets to accommodate 1 inch insulated glazing.

4. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with uniform
hairstline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

a. Hardware: Drill and cut to template for hardware. Reinforce frames and door stiles to receive hardware in accordance with manufacturer's recommendations.

b. Welding: Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

5. Finish: Match curtain wall system.

2.5 ENTRANCE DOOR HARDWARE

A. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."

1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2. Opening-Force Requirements:

a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.

b. Accessible Interior Doors: Not more than 5 lbf to fully open door.

B. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.

2.6 GLAZING

A. Glazing: Comply with Section 088000 "Glazing."

B. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.


C. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed curtain-wall manufacturers for this use.


D. 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 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 thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. 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.

C. Factory-Assembled Frame Units:
   1. Rigidly secure nonmovement joints.
   2. Prepare surfaces that are in contact structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion.
   3. Preparation includes, but is not limited to, cleaning and priming surfaces.
   4. Seal joints watertight unless otherwise indicated.
   5. Install glazing to comply with requirements in Section 088000 "Glazing."

D. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: -coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2.10 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.
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 and accepted in writing by the installer.

1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

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. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components plumb and true in alignment with established lines and grades.

D. Install glazing as specified in Section 088000 "Glazing."

1. 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.

E. Install weatherseal sealant according to Section 079200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.
3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install structural-sealant-glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
3. Alignment:
   a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
   b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
   c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.

4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Test Area: Perform tests on one bay at least 30 feet, by one story and a minimum of 2 other representative areas of glazed aluminum curtain walls determined by the Owner and Architect.

1. Tests must include perimeter joints to wall construction.

C. Field Quality-Control Testing: Perform the following tests per AAMA 503 with manufacturer's representation present on representative areas of structural-sealant-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 tests in areas as directed by Architect.

2. Air Infiltration: ASTM E 783 not to exceed 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
   a. Perform a minimum of three tests in areas as directed by Architect.

3. Water Infiltration: ASTM E 1105 at a minimum static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.
   a. Perform a minimum of three tests in areas as directed by Architect.

D. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

   1. Test a minimum of four areas on each building facade.

E. Structural-sealant-glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports.
PROJECT MANUAL FOR:
CP170621 - SCHOOL OF MUSIC NEW BUILDING
CP172801 - GENERAL SITE: SCHOOL OF MUSIC EXTENDED UTILITIES

END OF SECTION 084413

STRUCTURAL-SEALANT-GLAZED CURTAIN WALLS

084423 - 13
SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Mechanical door hardware for swinging doors.
   2. Electrified door hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
B. Shop Drawings: Details of electrified door hardware.
C. Samples: For each exposed product and for each color and texture specified.
D. Other Action Submittals:
   1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
      a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
      b. Reference Non-STC Rated Sound Control Doors where G1, G2, G3, G4 as labeled on door schedule.
      c. Content: Include the following information:
         1) Identification number, location, hand, fire rating, size, and material of each door and frame.
         2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
         3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
         4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

B. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
DOOR HARDWARE

D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
2. Comply with the following maximum opening-force requirements:

   a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
   b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch (13 mm) high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.

1.4 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 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.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

   1. 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.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.

3. Basis of Design Products: Where Specifications name a product, or refer to a scheduled product and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents, and that it will produce the indicated results, and that it is compatible with other portions of the Work.
   b. 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.
   c. Evidence that proposed product provides specified warranty.
   d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   e. Samples, if requested.

4. Product, Manufacturer: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements. Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.

5. Owner's Standard: Where Specifications refer to a product or manufacturer as an owner standard, substitutions are not allowed.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

B. Continuous Hinges: BHMA A156.26; minimum 0.120-inch (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

C. Continuous, Gear-Type Hinges: 6063-T6 Extruded-aluminum, pinless, geared hinge leaves joined by a continuous extruded-aluminum channel cap; with concealed, self-lubricating thrust bearings.
   1. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.
   2. Provide aluminum geared continuous hinges with factory fabricated cut outs for electrified power transfer where specified.

D. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled product manufactured by IVES Hardware; Allegion, PLC, (IVE) or a comparable product by:
   1. Hager Companies. (HAG)
   2. McKinney Products Company; an ASSA ABLOY Group company. (MCK)
   3. Stanley Commercial Hardware; Div. of The Stanley Works. (STA)
2.3 ELECTRIC POWER TRANSFER

A. Manufacturer: Subject to compliance with requirements, provide scheduled product manufactured by Von Duprin; Allegion, PLC. (VON)

B. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.

C. Locate electric power transfer per manufacturer's template and UL requirements.

2.4 MECHANICAL LOCKS AND LATCHES

A. Bored Locks: BHMA A156.2; Grade 1; Series 4000, tested to exceed 1,000,000 cycles.

B. Product: Subject to compliance with requirements, provide scheduled products manufactured by Best Lock Corporation; Stanley Security Solutions; (BES), or equivalent products by manufacturers listed below:
   1. Schlage Lock Corporation; Allegion, PLC; (SCH). ND Series, SPA lever.
   2. Sargent Lock; Assa Abloy Co.; (SAR). 10 Line, LP trim.

C. Requirements:
   1. Latchbolt: Steel with minimum 1/2” throw deadlatch on keyed and exterior functions; 3/4” throw anti-friction latchbolt on pairs of doors.
   2. Strikes: Provide manufacturer’s standard strike for HM frames, ANSI curved lip, 1 1/4” x 4 7/8”, 16 gauge, with 1” deep box construction, for each lock bolt or latchbolt. Provide extended lip strike, as required, for aluminum framing.

2.5 LOCK CYLINDERS

A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.


   2. Hardware supplier to supply temporary construction cores to contractor for use during construction phase. Temporary cores shall be returned to supplier after final core installation has been completed by owner.

2.6 KEYING

A. Keying System: Permanent cores are to be provided by owner.

B. Knox Box: Supplier to provide Knox Box for installation by general contractor. Knox series 3200 in aluminum. Part # 3263.

2.7 EXIT DEVICES AND AUXILIARY ITEMS

A. Exit Devices and Auxiliary Items: BHMA A156.3. Grade 1; except with extended cycle performance testing certified for minimum 8,000,000 cycles; listed by UL for accident and hazard; and conforming to applicable requirements of NFPA 80 and NFPA 101.

   1. Product: Subject to compliance with requirements, provide scheduled products manufactured by Von Duprin; Allegion, PLC. (VON).

   2. Requirements:
a. Internal springs: Coil compression type
b. Provide security dead latching for active latch bolts
c. Latch Bolts: Self-lubricating coating to reduce friction and wear. Plated latchbolts are not acceptable.
d. Touch Pad: Stainless steel with return stroke fluid dampers and rubber bottoming dampers.
e. Provide filler plates and shim kits as needed for flush mounting of devices on doors.
f. Devices with exposed rivets or screws on back of device that would be visible through a glass light are not acceptable.
g. Concealed vertical exit devices shall be a cable-actuated concealed vertical latch system. Vertical rods are not acceptable.

3. Products manufactured by Jackson Hardware: (JAC), are acceptable, provided that they exhibit the same form, function, and capabilities of the individual product configurations listed in the hardware schedule.

2.8 SURFACE CLOSERS

A. Surface Closers: BHMA A156.4 Grade 1; except tested to exceed 10 million (10,000,000) full load operating cycles by an independent test laboratory;

1. **Product**: Subject to compliance with requirements, provide products manufactured by LCN Closers; Allegion, PLC. (LCN)
   a. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use.
   b. Provide factory-sized rack-and-pinion hydraulic type closers that are adjustable to meet field conditions and requirements for opening force.
   c. Provide closers, constructed with high strength cast iron cylinders, forged main arms, and one piece forged steel pistons, with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm.
   d. Cylinder Body: 1½” piston diameter with 3/4” journal double heat treated shaft, 5/8” full complement bearing, chrome silicon steel spring.
   e. Hydraulic Fluid: ULTRA X™ fluid with constant temperature control from +120°F (49°C) to -30°F (~35°C).
   f. Closers with pressure release valves are not acceptable.

2.9 POWER SUPPLIES

A. Products: Schlage Electronics PS900 series or Von Duprin PS914 series, as appropriate for the application

B. Requirements:

1. Provide power supplies complete with required circuit boards, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component using the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

2.10 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.
1. **Basis-of-Design Product:** Subject to compliance with requirements, provide scheduled product manufactured by Ives Hardware; Allegion, PLC, (IVE) or a comparable product by:
   a. Hager Companies. (HAG)
   b. Rockwood Manufacturing Company. (ROC)

B. Provide door stops for all doors in accordance with the following requirements:

   1. Provide convex type wall stops wherever possible.
   2. Where wall stops cannot be used, provide floor stops of the proper height.
   3. At opening where wall or floor stop cannot be used, provide overhead stop.

2.11 **OVERHEAD STOPS AND HOLDERS**

A. Overhead Stops and Holders: BHMA A156.8.

   1. **Basis-of-Design Product:** Subject to compliance with requirements, provide scheduled product manufactured by Glynn-Johnson; Allegion, PLC, (GLY) or comparable product by one of the following:
      a. Architectural Builders Hardware Mfg., Inc. (ABH)
      b. Rockwood Manufacturing Company. (ROC)

2.12 **DOOR GASKETING**

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

   1. Manufacturers: Subject to compliance with requirements, provide the scheduled product or comparable product by one of the following:
      a. Hager Companies. (HAG)
      b. National Guard Products. (NGP)
      c. Reese Enterprises, Inc. (REE)
      d. Zero International. (ZER)

B. Refer to 083474 “Non-STC Rated Sound Control Doors”.

2.13 **THRESHOLDS**

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

   1. Manufacturers: Subject to compliance with requirements, provide the scheduled product or comparable product by one of the following:
      a. Hager Companies.
      b. National Guard Products.
      c. Reese Enterprises, Inc.
      d. Zero International.

B. Refer to 083474 “Non-STC Rated Sound Control Doors”.
2.14 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.

3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 HARDWARE INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Mounting Heights: Mount door hardware units at heights indicated or as required to comply with governing regulations.


2. Custom Steel Doors and Frames: HMMA 831.

C. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.

2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number 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.

E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 “Joint Sealants.”

G. 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 will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 SYSTEMS, SOFTWARE, AND HARDWARE

A. Coordinate with the Owner to ensure that the new components will be properly programmed into the system.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

3.4 DOOR HARDWARE SCHEDULE

A. Cross reference acoustic gaskets noted in 083474 “Non-STC Rated Sound Control Doors”.

HW SET NO. 01

FOR USE ON MARK/DOOR #(S):
V100/2 V101/2

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DOOR HARDWARE
EXIT DEVICE LATCH ELECTRICALLY RETRACTED (DOGGED) BY ACCESS CONTROL SYSTEM DURING DAYTIME HOURS, ALLOWING FREE ENTRY. AFTER HOURS ENTRY IS BY CARD READER/ELECTRIFIED EXIT DEVICE LATCH. INSIDE PUSH PAD ALLOWS FREE EGRESS AT ALL TIMES, IN ALL CONDITIONS. ELECTRIFIED EXIT DEVICE IS FAIL SECURE, AND REMAINS LOCKED DURING POWER FAILURE.

NOTE: AUTO OPERATOR ONLY FUNCTIONAL WHEN DOOR IS DOGGED DURING OPEN HOURS.

HW SET NO. 02

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EXIT DEVICE LATCH ELECTRICALLY RETRACTED (DOGGED) BY ACCESS CONTROL SYSTEM DURING DAYTIME HOURS, ALLOWING FREE ENTRY. INSIDE PUSH PAD ALLOWS FREE EGRESS AT ALL TIMES, IN ALL CONDITIONS. ELECTRIFIED EXIT DEVICE IS FAIL SECURE, AND REMAINS LOCKED DURING POWER FAILURE.
AT ALL TIMES, IN ALL CONDITIONS. ELECTRIFIED EXIT DEVICE IS FAIL SECURE, AND REMAINS LOCKED DURING POWER FAILURE.

HW SET NO. 03

FOR USE ON MARK/DOOR #(S):
C205/2

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DOOR CLOSED AND LOCKED FROM EXTERIOR UNLESS UNLOCKED REMOTELY VIA ACCESS CONTROL SYSTEM. INSIDE LEVER ALWAYS FREE EGRESS.

NOTE: INSTALL WEATHERSTRIP AT FRAME HEAD FIRST, THEN INSTALL CLOSER PA BRACKETS.

HW SET NO. 04

FOR USE ON MARK/DOOR #(S):
C102/1 S101/2

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DOOR HARDWARE
## HW SET NO. 05

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S402/3

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## HW SET NO. 06

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200A/1

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DOOR CLOSED AND LOCKED FROM CORRIDOR UNLESS UNLOCKED REMOTELY VIA ACCESS CONTROL SYSTEM. TERRACE SIDE LEVER ALWAYS FREE EGRESS INTO BUILDING.

HW SET NO. 07
FOR USE ON MARK/DOOR #(S):
130A/1  132A/1

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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 08
FOR USE ON MARK/DOOR #(S):
V100/4  V101/4

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<td>DOOR PULL</td>
<td>RM3312 MP 1-1/2” DIA X 84” LNG X 6HD</td>
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DOOR HARDWARE 087100 - 12
## HW SET NO. 09

**FOR USE ON MARK/DOOR #(#):**  
V100/3  
V101/3

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<tr>
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<td>GLY</td>
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<td>EA   SURF. AUTO</td>
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<td>EA   JAMB MT ACTUATOR</td>
<td>AA-3</td>
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## HW SET NO. 10

**FOR USE ON MARK/DOOR #(#):**  
130C/1  
132E/1

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<td>EA   PANIC HARDWARE</td>
<td>99-L-17</td>
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<tr>
<td>1</td>
<td>EA   SFIC RIM HOUSING</td>
<td>1E72 LESS CORE</td>
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<td>EA   PERMANENT CORE</td>
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<td>BES</td>
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<td>689</td>
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<td>(HEDA AT 182A/1)</td>
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<td>EA   SURFACE DOOR SWEEP</td>
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<td>ZER</td>
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<tr>
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<tr>
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<td>EA   RIM STRIKE MOUNTING BRACKET</td>
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<td>EA   CLOSER MOUNTING BRACKET</td>
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**NOTE:** DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER
HW SET NO. 10A

FOR USE ON MARK/DOOR #(S):
182A/1

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<tr>
<td>1</td>
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<td>NOTE CARD READER BY OWNER</td>
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<td>NOTE DOOR POSITION SWITCH(ES) BY OWNER</td>
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DOOR HELD OPEN WITH CLOSER ARM WHEN DESIRED. WHEN CLOSED AND LOCKED, ENTRY BY WALL MOUNT CARD READER, MOMENTARILY UNLOCKING OUTSIDE LEVER TRIM. INSIDE Push PAD ALWAYS FREE EGRESS.

NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 11

FOR USE ON MARK/DOOR #(S):
132D/1

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DOOR HARDWARE 087100 - 14
PROJEC

T MANUAL FOR: CP170621 – SCHOOL OF MUSIC NEW BUILDING CP172801 – GENERAL SITE: SCHOOL OF MUSIC EXTEND UTILITIES

11-2017

NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 12

FOR USE ON MARK/DOOR #(S):
281/1

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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 13

FOR USE ON MARK/DOOR #(S):
C205/1

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DOOR HARDWARE

087100 - 15
### HW SET NO. 14

**FOR USE ON MARK/DOOR #(S):**

S402/1

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<td>PERMANENT CORE</td>
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### HW SET NO. 15

**FOR USE ON MARK/DOOR #(S):**

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<td>689</td>
<td>LCN</td>
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**DOORS HELD OPEN DURING DAYTIME HOURS BY MAG HOLD-OPENS. WHEN DOORS ARE CLOSED AFTER HOURS, LEAF SWINGING INTO STAIR UNLOCKED BY WALL MOUNT CARD READER, MOMENTARILY RELEASING MAGNETIC LOCK. FREE EGRESS OUT OF STAIR AT ALL TIMES BY PANIC BAR ON LEAF SWINGING OUT OF STAIR.**

**MAGNETIC HOLD-OPENS AND MAGNETIC LOCK TO AUTOMATICALLY RELEASE UPON ACTIFICATION OF FIRE ALARM.**

**BALANCE BY DOOR SYSTEM MANUFACTURER.**

**DOOR HARDWARE**

087100 - 16
## DOOR HARDWARE

### HW SET NO. 16

**FOR USE ON MARK/DOOR #(S):**
- S201/1
- S301/1

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<tr>
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<td>689</td>
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MAG HOLD-OPEN TO AUTOMATICALLY RELEASE UPON FIRE ALARM ACTIVATION.

### HW SET NO. 17

**FOR USE ON MARK/DOOR #(S):**
- S202A/1
- S202A/2
- S302A/1
- S302A/2

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MAG HOLD-OPEN TO AUTOMATICALLY RELEASE UPON FIRE ALARM ACTIVATION.

### HW SET NO. 18

**FOR USE ON MARK/DOOR #(S):**
- S101/1

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DOOR HARDWARE 087100 - 17
DOOR HELD OPEN DURING DAYTIME HOURS BY MAG HOLD-OPEN. WHEN DOOR IS CLOSED AFTER HOURS, ENTRY TO STAIR BY WALL MOUNT CARD READER, MOMENTARILY UNLOCKING OUTSIDE LEVER. FREE EGRESS OUT OF STAIR AT ALL TIMES BY INSIDE LEVER.

MAG HOLD-OPEN TO AUTOMATICALLY RELEASE UPON FIRE ALARM ACTIVATION.

HW SET NO. 19
FOR USE ON MARK/DOOR #S:
132B/1  132F/1  132F/2  183/1

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HW SET NO. 20
FOR USE ON MARK/DOOR #S:
383A/1  385A/1  401/1  402/1

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PROVIDE FLOOR STOPS WHERE DOOR LEVER DOES NOT MEET WALL AT 90 OR 180 DEGREES.

NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER
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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

DOOR HARDWARE
HW SET NO. 23

FOR USE ON MARK/DOOR #(S):
130D/3 185/1

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HW SET NO. 24

FOR USE ON MARK/DOOR #(S):
S302A/3

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DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.
## HW SET NO. 25

FOR USE ON MARK/DOOR # (S):

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## HW SET NO. 26

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## HW SET NO. 27

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<tr>
<td>3</td>
<td>SILENCER SR64/65/66 AS REQ'D</td>
<td>630</td>
<td>GRY</td>
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<tr>
<td>1</td>
<td>REQUEST-TO-EXIT MOTION SCANNER SCANII</td>
<td>870</td>
<td>WHT</td>
<td>SCE</td>
</tr>
<tr>
<td>1</td>
<td>POWER SUPPLY PS902 900-2RS</td>
<td>870</td>
<td>LGR</td>
<td>SC</td>
</tr>
<tr>
<td>1</td>
<td>NOTE CARD READER BY OWNER</td>
<td>870</td>
<td>B/O</td>
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</tbody>
</table>
DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

### HW SET NO. 28

FOR USE ON MARK/DOOR #(S):

<table>
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<tbody>
<tr>
<td>3</td>
<td>HW HINGE 5BB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
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</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK 9K37D 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER 4111 HCUSH</td>
<td>689</td>
<td>LCN</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE 8400 10” X 2” LDW B4E</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>SILENCER SR64/65/66 AS REQ’D</td>
<td>GRY</td>
<td>IVE</td>
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### HW SET NO. 29

FOR USE ON MARK/DOOR #(S):

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<td>MANUAL FLUSH BOLT FB358</td>
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<td>DUST PROOF STRIKE DP1/DP2 AS REQ’D</td>
<td>626</td>
<td>IVE</td>
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</tr>
<tr>
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<td>STOREROOM LOCK 9K37D 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SURFACE OH STOP 90S</td>
<td>630</td>
<td>GLY</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>KICK PLATE 8400 10” X 1” LDW B4E</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>SILENCER SR64/65/66 AS REQ’D</td>
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### HW SET NO. 30

FOR USE ON MARK/DOOR #(S):

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</thead>
<tbody>
<tr>
<td>3</td>
<td>HW HINGE 5BB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
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DOOR HARDWARE
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<th>Catalog Number</th>
<th>Finish</th>
<th>Mfr</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CLASSROOM LOCK</td>
<td>9K37R 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>3</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>SILENCER</td>
<td>SR64/65/66 AS REQ'D</td>
<td></td>
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HW SET NO. 31

FOR USE ON MARK/DOOR #(S):
181/1  182/1

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<th>Finish</th>
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</thead>
<tbody>
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<td>1</td>
<td>CLASSROOM LOCK</td>
<td>9K37R 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
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</tbody>
</table>

BALANCE OF HARDWARE BY ACOUSTIC DOOR ASSEMBLY MANUFACTURER

HW SET NO. 32

FOR USE ON MARK/DOOR #(S):
383/1  385/1

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<th>Qty</th>
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<th>Finish</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>HW HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>CLASSROOM LOCK</td>
<td>9K37R 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE CLOSER</td>
<td>4111 HEDA</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW B4E</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>WS406/407CCV</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>ADJ GASKET (HEAD &amp; JAMBS)</td>
<td>770AA</td>
<td>AA</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>544A-MSLA-10</td>
<td>A</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>CLOSER MOUNTING BRACKET</td>
<td>770SPB</td>
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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER
HW SET NO. 33

FOR USE ON MARK/DOOR #(S):
380/1

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<tr>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Classroom Lock</td>
<td>9K37R 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Permanent Core</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>1</td>
<td>Electric Strike</td>
<td>6211 FSE DSLC</td>
<td>630</td>
<td>VON</td>
</tr>
<tr>
<td>1</td>
<td>Surface Closer</td>
<td>4111 W/ ST-3186</td>
<td>689</td>
<td>LCN</td>
</tr>
<tr>
<td>1</td>
<td>Floor Stop/Holder</td>
<td>FS497</td>
<td>626</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>Request-To-Exit Motion Scanner</td>
<td>SCANII</td>
<td>WHT</td>
<td>SCE</td>
</tr>
<tr>
<td>1</td>
<td>Note</td>
<td>CARD READER BY OWNER</td>
<td>B/O</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Note</td>
<td>DOOR POSITION SWITCH(ES) BY OWNER</td>
<td>B/O</td>
<td></td>
</tr>
</tbody>
</table>

DOOR CLOSED AND LOCKED, OR HELD OPEN BY FLOOR STOP/HOLDER. WHEN CLOSED, ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

BALANCE OF HARDWARE BY ACOUSTIC DOOR ASSEMBLY MANUFACTURER

HW SET NO. 34

FOR USE ON MARK/DOOR #(S):
102/1 103/1 104/1 105/1 106/1 107/1

<table>
<thead>
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<th>Qty</th>
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<th>Finish</th>
<th>Mfr</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Classroom Lock</td>
<td>9K37R 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>Permanent Core</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
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</table>

BALANCE OF HARDWARE BY ACOUSTIC DOOR ASSEMBLY MANUFACTURER

HW SET NO. 35

FOR USE ON MARK/DOOR #(S):
201/1 330/1 331/1 332/1 333/1 334/1 335/1 336/1 337/1 338/1 340/1 341/1 342/1 345/1 346/1 347/1 348/1 349/1 350/1

<table>
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<th>Catalog Number</th>
<th>Finish</th>
<th>Mfr</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HW Hinge</td>
<td>5BB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
</tr>
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</table>

DOOR HARDWARE
### Door Hardware

**NOTES:**
- Door Bottom Channel/Felt Strip by Door Manufacturer

#### HW Set No. 36

FOR USE ON MARK/DOOR #(S): 339/1 343/1

<table>
<thead>
<tr>
<th>Qty</th>
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<th>Catalog Number</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>HW HINGE 5BB1HW 4.5 X 4.5</td>
<td>5BB1HW</td>
<td>652</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>ENTRANCE LOCK 9K37AB 14D LESS CORE</td>
<td>9K37AB</td>
<td>626</td>
<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
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<tr>
<td>1</td>
<td>OH STOP 905 J (DOOR 339/1 ONLY)</td>
<td>630</td>
<td>GLY</td>
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<tr>
<td>1</td>
<td>WALL STOP WS406/407CVX (Omit at 339/1)</td>
<td>WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>ADJ GASKET (HEAD &amp; JAMBS) 770AA</td>
<td>770AA</td>
<td>AA</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>SURFACE DOOR SWEEP 39A A</td>
<td>39A</td>
<td>ZER</td>
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</tr>
<tr>
<td>1</td>
<td>THRESHOLD 544A-MSLA-10 A</td>
<td>544A-MSLA-10</td>
<td>ZER</td>
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</table>

**NOTE:** Door Bottom Channel/Felt Strip by Door Manufacturer

#### HW Set No. 37

FOR USE ON MARK/DOOR #(S): 209/1 210/1 211/1 301/1 302/1 303/1 304/1 305/1 306/1 307/1 308/1 309/1 310/1 311/1 312/1

<table>
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<tr>
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<td>9K37AB</td>
<td>626</td>
<td>SCH</td>
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<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
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<tr>
<td>1</td>
<td>WALL STOP WS406/407CVX</td>
<td>WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
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</table>

**Balance of Hardware by Acoustic Door Assembly Manufacturer**

**DOOR HARDWARE**

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**Note:** The content above is a structured list of hardware items with their descriptions, catalog numbers, finishes, and manufacturers. It includes specifications for classroom locks, entrance locks, wall stops, and other door hardware components. The notes indicate that the bottom channel/felt strip for doors is supplied by the door manufacturer. The hardware lists are organized by distinct sets (36 and 37), each with specific instructions for use on various door numbers.
HW SET NO. 38

FOR USE ON MARK/DOOR #(S):
202/1  206/1

<table>
<thead>
<tr>
<th>Qty</th>
<th>Description</th>
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<tbody>
<tr>
<td>3</td>
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<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ENTRANCE LOCK 9K37AB 14D LESS CORE</td>
<td>626</td>
<td>SCH</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>GASKETING 488S-BK</td>
<td>S-Bk</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>MORTISED DOOR SWEEP 53A</td>
<td>A</td>
<td>ZER</td>
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</tr>
<tr>
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<td>THRESHOLD 544A-MSLA-10</td>
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HW SET NO. 39

FOR USE ON MARK/DOOR #(S):
208/1  208/2

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</thead>
<tbody>
<tr>
<td>3</td>
<td>HW HINGE 5BB1HW 4.5 X 4.5</td>
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<td>IVE</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LOCK 9K37D 14D LESS CORE</td>
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<td>SCH</td>
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<tr>
<td>1</td>
<td>PERMANENT CORE OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
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<td>ELECTRIC STRIKE 6211 FSE DSLC</td>
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<tr>
<td>1</td>
<td>SURFACE CLOSER 4011</td>
<td>689</td>
<td>LCN</td>
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</tr>
<tr>
<td>1</td>
<td>WALL STOP WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
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</tr>
<tr>
<td>2</td>
<td>GASKETING 488S-BK</td>
<td>S-Bk</td>
<td>ZER</td>
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<tr>
<td>1</td>
<td>MORTISED DOOR SWEEP 53A</td>
<td>A</td>
<td>ZER</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>THRESHOLD 544A-MSLA-10</td>
<td>A</td>
<td>ZER</td>
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<td>1</td>
<td>REQUEST-TO-EXIT SCANII</td>
<td>WHT</td>
<td>SCE</td>
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<tr>
<td>1</td>
<td>POWER SUPPLY PS902 900-2RS</td>
<td>LGR</td>
<td>SCE</td>
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<td>NOTE DOOR POSITION SWITCH(ES) BY OWNER</td>
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DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.
HW SET NO. 40

FOR USE ON MARK/DOOR #(S):
204/1

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<tr>
<td>1</td>
<td>EA ENTRANCE LOCK</td>
<td>9K37AB 14D LESS CORE</td>
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<td>SCH</td>
</tr>
<tr>
<td>1</td>
<td>EA PERMANENT CORE</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
<td>BES</td>
</tr>
<tr>
<td>1</td>
<td>EA WALL STOP</td>
<td>WS406/407CVX</td>
<td>630</td>
<td>IVE</td>
</tr>
<tr>
<td>1</td>
<td>EA ADJ GASKET (HEAD &amp; JAMBS)</td>
<td>770AA</td>
<td>AA</td>
<td>ZER</td>
</tr>
<tr>
<td>1</td>
<td>EA SURFACE DOOR SWEEP</td>
<td>39A</td>
<td>A</td>
<td>ZER</td>
</tr>
<tr>
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<td>EA THRESHOLD</td>
<td>544A-MSLA-10</td>
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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 41

FOR USE ON MARK/DOOR #(S):
132C/1

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<td>EA HW HINGE</td>
<td>5BB1HW 4.5 X 4.5</td>
<td>652</td>
<td>IVE</td>
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<tr>
<td>1</td>
<td>EA ENTRANCE LOCK</td>
<td>9K37AB 14D LESS CORE</td>
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<td>SCH</td>
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<tr>
<td>1</td>
<td>EA PERMANENT CORE</td>
<td>OWNER SUPPLIED</td>
<td>626</td>
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NOTE: DOOR BOTTOM CHANNEL/FELT STRIP BY DOOR MANUFACTURER

HW SET NO. 42

FOR USE ON MARK/DOOR #(S):
134/1

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DOOR HARDWARE
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HW SET NO. 43
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HW SET NO. 44
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136/1 137/1 231/1 232/1 352/1 353/1

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HW SET NO. 45
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130C/2 132D/2 132E/2

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### Door Hardware

**HW Set No. 46**

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Note: Door bottom/edge channels/insulation by door manufacturer.

**HW Set No. 47**

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Note: Door bottom/edge channels/insulation by door manufacturer.

**HW Set No. 48**

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DOOR HARDWARE
2 EA PERMANENT CORE OWNER SUPPLIED 626 BES
( IF REQ'D )
1 EA HERC BRACKET HDB452 335 SCE
1 EA MAGNETIC LOCK M452P ATS/LED-2 628 SCE
1 EA PUSHBUTTON 621RDEX 629 SCE
1 EA REQUEST-TO-EXIT SCANII WHT SCE
MOTION SCANNER
1 EA POWER SUPPLY PS902 900-2RS-FA LGR SCE

DOORS CLOSED AND LOCKED, OR UNLOCKED ON TIME SCHEDULE. WHEN LOCKED, ENTRY BY
WALL MOUNT CARD READER, MOMENTARILY RELEASING MAGNETIC LOCK. ALWAYS FREE
EGRESS BY MOTION SCANNER OR WALL MOUNT PUSH BUTTON.

BALANCE OF HARDWARE BY GLASS DOOR SYSTEM MANUFACTURER

END OF SECTION 08 71 00
SECTION 088000 - 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.

B. SUMMARYSection includes:
   1. Glass for doors
   2. Glazed curtain walls.

C. Related Requirements:
   1. Section 084413 "Glazed Aluminum Curtain Walls"
   2. Section 084423 "Structural-Sealant-Glazed Curtain Walls" for glazing sealants used in structural-sealant-glazed curtain walls.
   3. Section 088813 "Fire-Resistant Glazing."

1.2 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.


D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Glass Samples: For each type of the following products; 12 inches square.
   1. Insulating glass each type.

C. Glazing Accessory Samples: For sealants, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. 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.

B. Qualification Data: For Installer and manufacturers of insulating-glass units with sputter-coated, low-E coatings, glass testing agency and sealant testing agency.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Low-Emitting Materials - Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior sealant, and sealant primer.
   1. Provide quantity take-offs for each sealant, and sealant primer.

E. Visible Light Transmittance: Include manufacturer's printed statement of visible light transmittance of installed glazing materials.

F. Product Certificates: For glass.

G. Product Test Reports: For 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.

H. Preconstruction adhesion and compatibility test report.

I. Minutes of preinstallation conference.

J. Sample Warranties: For special warranties.

1.7 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. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Architectural Sealants: 250 g/L.
2. Architectural Non-porous Sealant Primers: 250 g/l.
3. Architectural Porous Sealant Primers: 775 g/l.

F. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution. Refer to Section 084423 “Structural-Sealant-Glazed Curtain Walls”

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
2. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

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.

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: 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: 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: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated in glass schedules or comparable product by one of the following:

1. Vitro (PPG) Solarban 70XL
2. Guardian Industries Corp., SunGuard SNX 62/27
3. Viracon, Inc., VNE 1-63

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.

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: 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.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 “Quality Requirements,” to design glazing.

C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer’s published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
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.


B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of 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: As indicated.

E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. 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. 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.

C. 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.

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 polyisobutylene and silicone primary and secondary sealants.
   2. Spacer: Manufacturer's standard warm edge spacer material and construction.

B. Insulating-Glass Units, Low Iron: Virto (PPG) Starphire (Basis-of-Design)

C. Acoustical Innerlayer: Saflex Silentglass (Basis-of-Design)

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 25, Use NT.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. GE Construction Sealants; Momentive Performance Materials Inc.; SSG4000 UltraGlaze or SSG4000AC UltraGlaze.
      b. Tremco Incorporated; ProGlaze SSG.
   2. Applications: Structural-sealant glazed curtain wall glazing.

C. Structural Sealant: ASTM C 1184, chemically curing silicone formulation specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in curtain-wall assembly indicated.

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.

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).

F. 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.

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, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 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.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and 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 INSULATING GLASS SCHEDULE

A. Glass Type [IG-1]: 1-inch clear insulating glass, low-e-coated, with structural silicone shop-glazed aluminum cassette carriers.

1. Outdoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.

B. Glass Type [IG-1A]: 1-inch clear insulating glass, low-e-coated, with structural silicone shop-glazed aluminum cassette carriers.

1. Outdoor Lite: 1/4-inch (6 mm) monolithic heat strengthened clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.

C. Glass Type [IG-1B]: 1-inch clear insulating glass, low-e-coated, with structural silicone shop-glazed aluminum cassette carriers.

1. Outdoor Lite: 1/4-inch (6 mm) monolithic heat strengthened clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals

4. Indoor Lite: 1/4-inch (6 mm) monolithic annealed clear float glass.

D. Glass Type [IG-1C]: 1-inch clear insulating glass, low-e-coated (doors)

1. Outdoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.

E. Glass Type (IG-2): 1-inch translucent insulating glass, low-e-coated, with structural silicone shop-glazed aluminum cassette carriers.

1. Outdoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
5. Acid Etch: Walker "Textures" Opaque on #4 surface.

F. Glass Type (IG-2A): 1-inch translucent insulating glass, low-e-coated, with structural silicone shop-glazed aluminum cassette carriers.

1. Outdoor Lite: 1/4-inch (6 mm) monolithic heat strengthened clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully annealed clear float glass.
5. Acid Etch: Walker "Textures" Opaque on #4 surface.

G. Glass Type (IG-2B): 1-inch translucent insulating glass, low-e-coated (doors)

1. Outdoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
2. Low-E Coating: Ultra-neutral sputtered soft-coat on #2 surface.
3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

4. Indoor Lite: 1/4-inch (6 mm) monolithic fully tempered clear float glass.
5. Acid Etch: Walker "Textures" Opaque on #4 surface.

H. Glass Type (IG-3): 1 7/16-inch clear double laminated insulating glass, low-e-coated.

1. Outdoor Lite: 9/16-inch (14 mm) laminate heat strengthened clear float glass.
   a. Thickness of outer glass ply: 1/4-inch (6 mm)
   b. Interlayer: 1 ply 0.060-inch (1.52 mm) clear PVB
   c. Thickness of inner glass ply: 1/4-inch (6 mm)

2. Low-E Coating: Ultra-neutral sputtered soft-coat on #4 surface.
3. Interspace:
1. Outdoor Lite: 9/16-inch (14 mm) laminate heat strengthened clear float glass.
   a. Thickness of outer glass ply: 1/4-inch (6 mm).
   b. Interlayer: 1 ply 0.060 inch (1.52 mm) clear PVB
   c. Thickness of inner glass ply: 1/4-inch (6 mm)

2. Low-E-Coating: Ultra-neutral sputtered soft-coat on #4 surface.

3. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

4. Center Lite: 1/4-inch (6 mm) monolithic annealed low iron float glass

5. Interspace:
   a. Content: 90% Argon
   b. Interspace Width: 1/2-inch nominal (12.7 to 13.5 mm) warm edge spacer, black with black seals.

6. Indoor Lite: 3/8-inch (10 mm) laminated annealed clear float glass
   a. Thickness of outer glass ply: 3/16-inch (5 mm)
   b. Interlayer: 1 ply 0.030 inch (0.76 mm) clear acoustical PVB.
   c. Thickness of inner glass ply: 3/16-inch (5 mm).

END OF SECTION 088000
SECTION 088300 - 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. Annealed monolithic glass mirrors.

B. Related Sections:
   1. Section 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.
   2. Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
   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. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of the following products:
   1. Mirrors: 12 inches square, including edge treatment on two adjoining edges.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Recycled Content: Manufacture's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.
   1. Mirror.

D. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.
1. Provide quantity take offs for each adhesive.

E. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

B. Low-Emitting Materials - Adhesives: Provide quantity of each interior adhesive used.

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 Certified Glass Installer Program.

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.

D. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:

   1. Multipurpose Construction Adhesives: 70 g/L.

E. Glazing Publications: Comply with the following published recommendations:

   1. GANA’s "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.

   2. GANA Mirror Division’s "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

F. Safety Glazing Products: For mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

1.7 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.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.
1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror 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 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

B. Clear Glass: Mirror Select Quality; ultraclear (low-iron) float glass with a minimum 91 percent visible light transmission.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

2.3 MIRROR HARDWARE

A. Top and Bottom 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 bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than [0.04 inch] [0.05 inch].

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

      2) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.

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

      2) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, cut mirrors to final sizes and shapes.

B. Cutouts: 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: Flat 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 mirror mastic with existing finishes or primers.

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.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. Wall-Mounted Mirrors: 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. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch 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 air space of 1/8 inch 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 will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 088300
SECTION 088500 GLAZING 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 glazing accessories for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Engineered Transition Assemblies (ETA).
   2. Glazing Sealants for installation of (ETA).

B. Related Sections:
   1. Section 072726 "Fluid Applied Membrane Air-Barrier Systems" for coordination of (ETA) installation with air-barrier systems.
   2. Section 079200 "Joint Sealants" for sealants installed at intersections building material substrates.
   3. 08 44 13 "Glazed Aluminum Curtain Walls" for coordination with installation of (ETA) at existing windows.

1.3 PERFORMANCE REQUIREMENTS

A. General: Installed glazing accessory systems shall withstand normal thermal movement and wind loads without failure, including loss attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or (ETA) to remain watertight and airtight; deterioration of glazing accessory materials; or other defects in construction.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Contractor is to engage a qualified testing agency to perform preconstruction testing. Test each glazing accessory material type, sealant, for adhesion to and compatibility with elastomeric glazing sealants weather barrier membrane systems and substrates.
   1. Submit to sealant manufacturer, samples of each glazing accessory, air barrier, flashing and framing material that will contact or affect glazing sealants for compatibility and adhesion testing as indicated below:
   2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
   3. Test no fewer than eight Samples of each type of material, including air barrier membrane substrates, coatings 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.

1.5 ACTION SUBMITTALS

A. Product Data: For each Engineered Transition Assemblies (ETA), glazing sealant and glazing accessory material indicated.

B. Shop Drawings: Provide shop drawings coordinated with curtain wall and air barrier systems.
   1. Include plans, elevations, sections, and attachment details.
   2. Detail fabrication and installation layouts, joint locations, and keyed details.
   3. Include details for joining, supporting, and securing, including layout and spacing of fasteners and other attachments.
   4. Include substrate preparation method, location and extents and process.
   5. Include details of termination points and assemblies.
   6. Include details of special conditions.
   7. Include details of connections to adjoining work and comply with requirements of the COORDINATION section below.

C. Glazing (ETA) and Accessory Samples: For (ETA) and sealants, in 300-mm lengths.
   1. Provide 3 samples for review and samples as required for close out procedures.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers manufacturers of sealant accessories and sealant testing agency.
   1. In addition to experience qualification information provide a list of projects of similar nature by both manufacturer and installer that have been installed during last five (5) years.
   2. In addition to experience qualification information provide a list of projects by the testing agency of similar nature that have undergone similar specified testing during last five (5) years.

B. Product Certificates: For glazing accessory products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for glazing sealants and glazing accessories.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.
   1. Submit compatibility and adhesion test reports required as part of Quality Control requirements of this specification section.

E. Certificates from glazing materials manufacturers certifying that their products comply with the specified requirements of this specification.

F. Certification that shop drawings for ETA Engineered Transition Assembly supplied by contractor have been reviewed by the manufacturer and are approved as an acceptable application of the assembly.

G. Minutes of preinstallation conference.

H. Field quality-control reports.
I. Sample Warranties: Submit copies conforming to warranty requirements of this Section.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A qualified manufacturer with ten (10) years of air barrier manufacturing experience for membrane systems of the types specified for this Project.
2. Minimum ten (10) years previous successful experience in installations of similar systems.

B. Installer Qualifications:

1. A qualified firm that is approved, authorized, or licensed by glazing accessory system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
2. Installer having at least five (5) years' experience installing glazing accessory systems similar to that used for this Project and has successfully completed a minimum of five (5) previous projects of similar in system and nature and of equal or greater size to this Project in the last two years.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

D. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for Engineered Transition Assemblies, Sealants, and Other Gazing Accessories in order to ensure consistent quality of performance.

E. Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing substrate and weather barrier / air barrier membrane materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

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. All materials and submittals materials that constitute the mockup(s) must be submitted and approved prior to mockup construction.
2. Build integrated mockups of exterior the wall assembly at the location shown on Drawings or if not shown at a location directed by the Architect, incorporating backup wall construction, air barrier assembly, curtainwall assemblies, (ETA) glazing accessories, flashings, insulation, external cladding and other penetrations, and flashings to demonstrate surface preparation, crack and joint treatment, application of air barriers, installation of glazing accessories, sealants and the sealing of gaps, terminations of materials, transitions between materials, installation of anchors and supports for exterior closure assemblies.
3. Coordinate construction and testing of mockups to permit inspection observations by Architect and owner's inspection agency. Provide notification a minimum of 72 hours in advance.
4. If it is determined mockups do not comply with requirements, reconstruct mockups until mockups are approved.
5. Mockups are to be reviewed and tested in phases or stages of completion. For example: air barrier installation and glazing accessories are to be installed and tested prior to installing cladding systems mockup. Coordinate phasing for each mockup type with Architect.
6. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
7. Prepare mockup for testing requirements: Testing glazing accessory installation is to be performed prior to the installation of cladding systems.
8. Approval of mockup does not constitute approval of deviations from the Contract Documents contained in mockup unless the Architect specifically approves such deviations in writing.
9. Subject to compliance with requirements, approved mockup may become part of the completed Work if undisturbed at time of Substantial Completion.
G. Preinstallation Conference: Conduct conference at Project site. Comply with requirements in Division 01 Section "Construction Execution and Coordination." Review methods and procedures related to roofing system including, but not limited to, the following:

1. Meet with Owner Architect, testing and inspecting agency representative, (ETA) manufacturer's technical representative and installer, air barrier technical representative and installer, curtainwall technical representative and installer, and installers whose work interfaces with or affects (ETA) assemblies.

2. Review methods and procedures related to glazing accessory installation, including manufacturer’s written instructions.

3. Review and finalize construction schedule. Verify availability of materials, Installer’s personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review window surface and air barrier cleaning and preparation requirements for sealant, transition assemblies and flashings.

5. Review and examine other existing substrate requirements for conditions and finishes, including flatness, surface preparation and acceptance by manufacturer / installer.

6. Review, discuss, and coordinate the interrelationship of aluminum windows with Engineered Transition Assembly (ETA) and other exterior wall components. Include provisions for anchorage, flashing, sealing, and protection of finishes.

7. Review special (ETA) details, attachments and condition of other construction that affect (ETA) installation.

8. Review temporary protection requirements for (ETA) assemblies during and after installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing accessory materials according to manufacturer's written instructions. Prevent damage glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing accessory installation when ambient and substrate temperature conditions are outside limits permitted by glazing accessory material manufacturer and when substrates are wet from rain, frost, condensation, or other causes. Comply with manufacturer's installation requirements.

1.10 WARRANTY

A. Manufacturer's Special Warranty for glazing accessories: Products: Manufacturer's standard or customized form in which manufacturer agrees to replace/repair defective materials that deteriorate within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion.

B. Installer's Warranty: In addition, furnish a written warranty agreeing to repair/replace defective installation and workmanship labor causing leakage of water, deterioration of materials, and other failures of the installed system, sealants, coatings, and related work on this project, to perform as required within the warranty period. Repair work is to include removal and replacement of cladding materials concealing Glazing Accessory systems at no cost to the Owner.

1. Warranty Period: Five (5) years from date of Substantial Completion.
1.11 COORDINATION

A. Manufacturer and installer of materials and systems installed under this section are required to coordinate and develop compatible weather tight transition and anchor penetration assemblies with the manufacturers and installers of roofing, air barrier, glazing accessory, sealant and waterproofing assemblies. Manufacturers involved in resolved transition assemblies are to provide written approval of transition assemblies as part of the submittal information.

PART 2 - PRODUCTS

2.1 GLAZING ACCESSORY PRODUCTS, GENERAL

A. Engineered Transition Assemblies: Provide the Basis of design system and products or Approved equivalent silicone transition by Dow Corning.

1. Basis of Design Air Barrier Perimeter Seal to Windows, Doors Systems: Provide Proglaze Engineered Transition Assembly (ETA), manufactured by Tremco, Inc., evaluated in accordance with the following properties:

   a. ASTM E 283 Test Method for Determining Rate of Airflow Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Differences Across the Specimen
   b. ASTM E 330 Test Method for Structural Performance of Exterior Windows, Curtain Wall and Doors by Uniform Static Air Pressure Differential
   c. ASTM E 331 Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference
   d. ASTM E 547 Test Method for Water penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference

2. The engineered transitions assembly is comprised of the following components:

   b. Silicone Rubber Corners (SRC): Pre-molded, 40 durometer, translucent silicone.
   c. Silicone Sealants: Comply with ASTM C 920, single-component, neutral-curing silicone; Class 100/50, Grade NS, Use O. Product shall be: Spectrem 1 as manufactured by Tremco.
   d. Primers: The sealant manufacturer may determine that a primer is necessary for good sealant adhesion on some substrates. Use only those primers recommended by the sealant manufacturer for use with the specified sealant on the specific substrate.

2.2 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

2.3 FABRICATION OF (ETA) ASSEMBLIES

A. Fabricate assemblies in sizes required to fit openings indicated for Project complying with written instructions of product manufacturer to comply with system performance requirements.

B. Gasket Molded Corners:

   1. Molded Corners for glazing gaskets shall be fabricated prior to delivery.
   2. Gaskets shall be fabricated within tolerances that will allow proper fit in the designated window opening so that fit at the corners will provide a continuous seal.
3.1 EXAMINATION

A. Examine substrates to receive glazing accessories and conditions under which, glazing accessories will be installed, with Installer present, for compliance requirements for installation tolerances and other conditions affecting performance and with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Examine the substrates to verify that there are no conditions such as inadequate anchorage, foreign materials, moisture, ridges, or other conditions, which would prevent the satisfactory installation of the (ETA) system.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of glazing accessories.

C. Proceed with installation only after unsatisfactory conditions have been corrected and accepted in writing by the installer.
   1. Start of execution for work of this Section constitutes acceptance of substrate and site conditions by the installer.

3.2 PREPARATION

A. Clean substrates receiving glazing accessories immediately before installation. Remove coatings not firmly bonded to substrates.

B. Glazing Seals and Sealants
   1. All surfaces receiving glazing seals and sealants shall be thoroughly wiped with a clean cloth dampened with high performance cleaners as approved by the sealant manufacturer, such as Xylene or Toluene with Polyurethane sealants, MEK or IPA with Silicone sealants or manufacturer’s proprietary cleaners. Wipe dry using a clean cloth, changing frequently. Special precautions must be taken in cold weather to insure the surfaces are free from frost or condensation.
   2. Verify cleaners and cleaning process is compatible with the existing window systems and existing finishes.

3.3 INSTALLATION, GENERAL

A. Comply with combined written instructions of manufacturers of glazing accessories and sealants.

B. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Contractor is to engage a qualified testing agency to perform tests and inspections.
   1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
B. Coordinate testing schedule to permit observations by Architect and Owner’s testing agency.
   1. Provide notification a minimum of 72 hours in advance.

C. Testing Services: Testing and inspecting of installed ETA assemblies shall take place as follows:
   1. Coordinate testing schedule and scope with section 084413 “Glazed aluminum Curtainwall” to test entire assembly during the same test.
   2. Testing Methodology: Testing of ETA for air infiltration and water resistance shall be performed according to AAMA 502 in conjunction with smoke tracers.
   3. Air-Infiltration Testing:
      b. Allowable Air-Leakage Rate: 1.5 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
   4. Water-Resistance Testing:
      b. Allowable Water Infiltration: No water penetration.
   5. Testing Extent:
      a. Test Mockup.
      b. Test ETA at locations to be selected at random by Architect and Owner’s representative.
      c. To ensure only the ETA assemblies are being tested, temporarily mask and seal the existing window with non-permeable membranes.
   6. Test Reports: Prepared according to AAMA 502
   7. Water Spray Test: Test all ETA installations not tested in accordance with AAMA502 for water penetration according to AAMA 501.2

D. Remove and replace noncomplying glazing accessories and retest as specified above.
E. Glazing Accessory systems will be considered defective if it does not pass tests and inspections.
F. Additional testing and inspecting, at Contractor’s expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING AND PROTECTION

A. If masking tape is used to prevent contamination of adjacent surfaces, it must be removed before the sealant has a chance to cure.
B. Any sealants or sealant primers that have contaminated visible, adjacent surfaces shall be removed immediately, prior to cure. Procedures necessary to remove sealant or primers that have been allowed to cure may cause permanent damage to the surfaces.
C. Remove and properly dispose of all waste materials and debris resulting from the work of this section.

END OF SECTION 0880500
SECTION 088813 - 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.
      2. Fire rated framing systems for installation as windows in interior openings.

1.3 DEFINITIONS
   A. Glass Manufacturers: Firms that produce primary glass, fabricated glass or framing, 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 submit latest edition of manufacturer’s product data providing product descriptions, technical data, Underwriters Laboratories, Inc. listings an installation instructions.
   B. Shop Drawings:
      1. Include plans, elevations and details of product showing component dimensions; framing opening requirements, dimensions, tolerances, and attachment to structure.
   C. Samples: For following products:
      1. For each type of glass product; 12 inches square.
      2. Sample of frame.
      3. Verification of sample of selected finish.
   D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers and glass testing agency.

B. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are classified and labeled by UL, for fire ratings indicated, based on testing according to NFPA 257 and UL9.

C. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Low-Emitting Materials - Sealants: Include manufacturer’s printed statement of VOC content in g/l for each interior sealant, and sealant primer.
   1. Provide quantity take offs for each sealant, and sealant primer.

E. Visible Light Transmittance: Include manufacturer’s printed statement of visible light transmittance of installed glazing materials.

F. Product Certificates: For each type of glass and glazing product, from manufacturer.

G. Minutes of preinstallation conference.

H. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Sealants: Provide the quantity of each interior sealant and sealant primer used.

1.8 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.

B. Low-Emitting Materials - Sealants: Use interior sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Architectural Sealants: 250 g/L.
   2. Architectural Non-porous Sealant Primers: 250 g/l.
   3. Architectural Porous Sealant Primers: 775 g/l.

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.

1.10 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.
1.11 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 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass and Frame Assembly: Obtain from single source from single manufacturer for each glass type and frame 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. 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.


B. Safety Glazing Labeling: 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 glass, glass thickness, and safety glazing standard with which glass complies.

2.4 GLASS PRODUCTS

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 unless fire-protection or fire-resistance rating is based on another product.

2. Thickness: 2-1/4 inch, #120-106

3. Interlayer Thickness: Provide thickness as needed to comply with requirements.

4. Interlayer Color: Clear unless otherwise indicated
2.5 FIRE-RESISTANCE-RATED GLAZING [GL6]

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.

1. 450 deg F (250 deg C) temperature-rise limitation

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. Technical Glass Products; Pyrostop (Basis-of-Design).
      1) Manufacturer's Designation: 120-106, 120 minutes
      2) Glazing Type: IGU
      3) Daylight Transmission: 75 %
      4) Sound Transmission Coefficient: 46 dB

2. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 795.
   b. GE Construction Sealants; Momentive Performance Materials Inc; SilGlaze II SCS2800.
   c. Tremco Incorporated; Spectrem 2.

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

D. 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.

E. 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 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.6 ALUMINUM FRAMES, GENERAL

A. Aluminum Framing System, 120 minute

1. Steel Frame: The steel framing members are made of two halves, nom. 1.9 inch wide with a nom. minimum depth of 1.38 inch with lengths cut according to glazing size.

2. Aluminum Trim: Supplied with the steel framing members. Nom. 2 inch wide with a nom. depth of 1.54 inch with lengths cut according to glazing size.

3. Stainless Steel Standoffs supplied with the steel framing members. Nom. 5/16” inch diameter with a nom. minimum depth of 1-1/8 inches with depth adjusted to match glazing panel thickness.
4. Stainless Steel Moment and Connecting Braces: Supplied with the steel framing members, nom. 3/8 inch thick with a nom. depth of 1-1/8 inches with depth cut according to glazing thickness.
5. Glazing Gasket: Supplied with the steel framing members. Nom. 3/4 inch x 3/16 inch black applied to the steel framing members to cushion and seal the glazing material when installed.

2.7 FIRE-RESISTANCE-RATED FRAMING

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

   a. ‘H’ style cover cap
   b. Clear Anodized finish
   c. 120 minute rating

2.8 MISCELLANEOUS 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.

D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

PART 3 - EXECUTION

3.1 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. 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.

C. 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.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.

2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

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 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 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 right before each glazing unit is installed.

F. 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.

G. 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.

D. 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. 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 washaway 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.

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 days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088813
SECTION 092116.23 - GYPSUM BOARD SHAFT WALL 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: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS
   A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 INFORMATIONAL SUBMITTALS
   A. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.
   B. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
      1. Gypsum.
      2. Paper.
   C. Low-Emitting Materials - Adhesives: Include manufacturer’s printed statement of VOC content in g/l for each interior adhesive.
      1. Provide quantity take offs for each adhesive.
   D. Evaluation Reports: For shaft wall assemblies, from ICC-ES.

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

1.6 CLOSEOUT SUBMITTALS
   A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.
1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Gypsum Board and Panel Adhesives: 50 g/L.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: As indicated.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated.

2. Minimum Base-Metal Thickness: 0.033 inch.

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least [2 inches] <<Insert dimension>> long and matching studs in depth.

1. Minimum Base-Metal Thickness: 0.033 inch.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches, matching studs in depth, and not less than 0.033 inch thick.
2.3 PANEL PRODUCTS

A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25% percent by weight.

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

C. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer’s proprietary fire-resistive liner panels with paper faces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; ProRoc Shaftliner.
   b. Georgia-Pacific Building Products; ToughRock Fireguard Shaftliner.
   c. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
   d. USG Corporation; Sheetrock Brand Gypsum Liner Panel.

2. Thickness: 1 inch.


D. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer’s proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. CertainTeed Corp.; ProRoc Moisture and Mold Resistant Shaftliner.
   b. Georgia-Pacific Building Products; Dens-Glass Ultra Shaftliner.
   c. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
   d. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

2. Thickness: 1 inch.


4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

E. Gypsum Board: As specified in Section 092900 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Recycled Content of Steel: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.


C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
2.5 **AUXILIARY MATERIALS**

A. **General:** Provide auxiliary materials that comply with manufacturer's written recommendations.

B. **Trim Accessories:** Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. **Steel Drill Screws:** ASTM C 1002 unless otherwise indicated.

D. **Track Fasteners:** Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

   1. **Expansion Anchors:** Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
   2. **Power-Actuated Anchors:** Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. **Sound Attenuation Blankets:** As specified in Section 092900 "Gypsum Board."

F. **Acoustical Sealant:** As specified in Section 079205 "Acoustical Sealant"

**PART 3 - EXECUTION**

3.1 **EXAMINATION**

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

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

3.2 **PREPARATION**

A. **Sprayed Fire-Resistive Materials:** Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.
3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
   1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
   2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

J. Rating identification: Permanently stencil identification of fire rated walls in concealed locations above ceilings and inside of mechanical rooms.
   1. 1 1/2 inch high letters, Color Black
   2. Font Style: Arial.
   3. Spacing 6'-0" o.c..

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.
END OF SECTION 092116.23
SECTION 092216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:
   1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
   2. Section 092316 "Resiliently Supported Partitions" designated with "R" label.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
   1. Metal Sheets.
   2. Galvanizing.

C. Evaluation Reports: For steel studs and runners, from ICC-ES.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Notify manufacturer of damaged materials received prior to installation.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Protect non-structural metal framing from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's "Code of Standard Practice".
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. Acoustic Rated: Provide materials and constructions as specified on the general "G" and "R" partition details and room specific wall section details.

2.2 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.


C. Studs and Runners: ASTM C 645.[ Use either steel studs and runners or high-strength steel studs and runners.]

1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: [As indicated on Drawings] [0.018 inch] [0.027 inch] [0.033 inch].
   b. Depth: As indicated on Drawings.

2. High-Strength Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: Drawing metal thickness shown for non-high-strength steel studs and runners. Provide structurally equivalent thickness of high-strength steel studs and runners per ICC ES AC86..
   b. Depth: As indicated on Drawings.

D. Slip-Type Head Joints: Where indicated, provide the following:

1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.

2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

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

      1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      2) Steel Network Inc. (The); VertiTrack VTD Series.
      3) Telling Industries; Vertical Slip Track.

E. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
1. Products: Subject to compliance with requirements, provide one of the following:
   a. Fire Trak Corp.; Fire Trak System [attached to studs with Fire Trak Posi Klip].
   b. Grace Construction Products; FlameSafe FlowTrak System.
   c. Metal-Lite, Inc.; The System.

F. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
   1. Minimum Base-Metal Thickness: 0.033 inch.

G. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch thick, galvanized steel.

H. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.033 inch.

I. Resilient Furring Channels: 1/2-inch deep, steel sheet members designed to reduce sound transmission.

J. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: As indicated on Drawings.
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch.

K. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to [5] <Insert number> times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Cast-in-place anchor, designed for attachment to concrete forms.
   2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch-wide flanges.
D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.

   a. Minimum Base-Metal Thickness: 0.033 inch.

E. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, provide one of the following:
   b. Chicago Metallic Corporation; Drywall Grid System.
   c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls:

1. Provide one of the following:
   a. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
   b. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced [24 inches] [600 mm] o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: [48 inches] <Insert spacing> o.c.
2. Carrying Channels (Main Runners): [48 inches] <Insert spacing> o.c.
3. Furring Channels (Furring Members): [16 inches] [24 inches] <Insert spacing> o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216
SECTION 092316 - RESILIENTLY SUPPORTED PARTITION ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Provide resiliently supported partition assemblies where walls labeled type “R”, and as specified herein, gypsum board, metal studs, nested channels, and felt. Partitions noted as type “R” walls at no time be penetrated with any construction element unless otherwise noted. Refer to penetration restriction drawings for exemptions.

1. Related Work
2. Thermal and Moisture Protection
3. Openings
4. Non-Structural Metal Framing
5. Finishes
6. HVAC
7. Electrical
8. Plumbing

1.2 REFERENCES

A. The work is subject to applicable portions of ASTM C423-97a.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For gypsum board and acoustic batt insulation products

1. Reference specification 072100 and 092900.

B. For felt at resilient head and base channel assemblies

1. Accurate Felt and Gasket Manufacturing Company, Inc.; Telephone: (708) 780-9000; Website: https://www.afgco.com/
2. American Felt and Filter Company; Telephone: (845) 561-3560; Website: http://www.affco.com/
4. Superior Felt & Filtration; Telephone: (815) 759-1234; Website: www.superiorfelt.com
2.2 MATERIALS

A. Gypsum Wallboard
   1. Sheet panels shall be the sizes and dimensions indicated on the drawings, but shall not have a thickness less than 5/8” in partition installations.

B. Acoustic Batt Insulation
   1. Minimum 3” thickness, 1.5 to 3.0 pcf.

C. Acoustic Sealant
   1. Permanently resilient acoustic sealant as specified elsewhere in the Project.

D. Felt
   1. Society of Automotive Engineers industrial felt designation F-1 or F-3 as follows
      a. Thickness: minimum 1/4”
      b. Density: minimum 21 pcf
      c. Composition: 100% synthetic or wool and synthetic composition – 95% wool and 5% synthetic material.

E. Isolated Wall Sway Braces
   1. Isolated Wall Sway Braces for “R” walls bracing to CMU walls: Double height resilient walls to have intermediate resilient support, spacing to be determined by manufacturer.
      a. Kinetics Noise Control, Inc., Telephone: (614) 889-0480
         Website: http://www.kineticsnoise.com,
         model Unibrace-L or PSB.
      b. Mason Industries, Inc., Telephone: (516) 348-0282,
         Website: www.mason-ind.com
         model type DNSB or WIC.
      c. VMC Group, Telephone: (800) 569-8423,
         Website: www.thevmcgroup.com
   2. Location: Large Instrumental Rehearsal and where deemed necessary structurally and approved by acoustic consultant.

2.3 ALTERNATIVE

1. The following is an approved alternative to the felt and double runner assembly.
   a. Pliteq Inc, Telephone: (416) 449-0049
      Website: http://pliteq.com
      GenieMat Iso-Sill and grommet
   b. Kinetics Noise Control, Inc., Telephone: (614) 889-0480
      Website: http://www.kineticsnoise.com,
      Wallmat and grommet
   c. VMC Group, Telephone: (800) 569-8423,
      Website: www.thevmcgroup.com
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and surrounding conditions to receive partition. Verify dimensions for location and layout of framing.

3.2 INSTALLATION

A. Refer to wall details on architectural drawings.

B. Refer to 092216 Non-Structural Metal Framing and 092900 Gypsum Board for additional installation instructions.

C. Resiliently Supported Structure

1. Continuously line outer channel of head and base runners with specified felt. Felt may be scored or cut into strips for the walls and base of the channels to allow the inner channel to more fully nest with the lined outer channel. Do not allow any rigid connections to fasten and connect the inner and outer channels through the felt, as this will negate the stud assembly’s resilient support.

D. Gypsum Wallboard

1. See drawings for number of layers of gypsum sheetrock. Each layer of gypsum board shall be fully bonded to each other with staggered seams and attached to resiliently suspended framing. Tape and apply joint compound at bottom layer only, if visually exposed.

E. Install items plumb (or as indicated on the Contract Documents), straight, square, level and in the elevation, plane and location as specified herein or as shown on the drawings.

END OF SECTION 092316
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SECTION 092600 – BARRIER CEILINGS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS
   A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.
   B. Specifications relates to CLG-2, -3 and -4 as detailed on A042.

1.2 SECTION INCLUDES
   A. The Work of this Section includes:
      1. Resiliently hung multi-layer gypsum board ceiling system.
      2. Gypsum board.
      3. Resilient isolation hangers
      4. Suspended metal framing system.
      5. Sound batt insulation.

1.3 RELATED SECTIONS
   A. Thermal and Moisture Protection – Section 7.
   B. Metal Support Assemblies and Gypsum Board – Section 9.

1.4 SUBMITTAL
   A. Vibration isolation manufacturer to submit shop drawings showing complete details including all dimensions, materials, finishes, hanging hardware. All loads supported by vibration isolation springs should be accounted in calculations and noted on shop drawings for confirmation. Shop drawings should include specific spring isolator selections for every hanging point.

1.5 QUALITY ASSURANCE
   A. The work is subject to applicable portions of ASTM C423-97a.
   B. Ceilings noted as “Barrier Ceilings” shall at no time be penetrated with any construction or MEP/F elements including acoustic-access door panel systems unless noted specifically on the drawings or discussed with project acoustic consultant.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Board and Acoustic Batt Insulation Products:

1. Reference specification 072100 and 092900.

B. Acoustic Isolation Products:


2.2 GYPSUM WALLBOARD

A. Multiple layers as detailed, each not less than 5/8" thick. Reference 092900 Gypsum Board.

2.3 ACOUSTIC BATT INSULATION

A. 3-1/2 inches thick, minimum, 3-4 pcf. Reference 072100 Thermal Insulation.

2.4 ACOUSTIC SEALANT

A. Permanently resilient acoustic sealant. Refer to Section 079205 for acceptable sealants.

2.5 ACOUSTIC ISOLATION HANGERS

A. CLG-2 and CLG-3: Combination steel spring in series with a resilient molded neoprene noise and vibration isolation pad. Components, assembly and layout to be sized to carry the required loads. Springs to be spaced and selected as required to achieve minimum 1" static deflection. Neoprene elements shall be molded with a rod isolation bushing that passes through the hanger box that prevents the rod from contacting the hanger box. The diameters of the spring and the hole in the mounting box shall allow for 15-degree misalignment from vertical before mechanical short circuit occurs.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Isolation hangers and suspension system sized and internally braced to carry the loads imposed by multiple layers of gypsum board and all devices supported from barrier ceiling.

B. No bracing shall touch structure or walls. Framing shall be held off the perimeter walls minimum ½” and sealed airtight with continuous acoustic sealant.
C. Multi-layer gypsum wallboard as detailed, with each layer fully bonded to each other with staggered seams and attached to resiliently suspended framing.

D. Tape and apply joint compound required at bottom layer only, if visually exposed.

END OF SECTION 092600
SECTION 092900 - GYPSUM BOARD

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 gypsum board.
   2. Tile backing panels.
   3. Bridge Quality Neoprene Bearing Pad

B. Sound Barrier Mullion Top Cap

Related Requirements:
   1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
   2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for metal shaft-wall framing, gypsum shaft liners, and other components of shaft-wall assemblies.
   3. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.
   4. Section 093000 "Tiling" for cementitious backer units installed as substrates for ceramic tile.
   5. Section 092316 "Resiliently Supported Partition Assemblies"
   6. Section 092600 "Barrier Ceilings"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:
   1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
   1. Gypsum.
   2. Paper.

C. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive, sealant, and sealant primer.
1. Provide quantity take offs for each adhesive, sealant, and sealant primer.

1.5 CLOSEOUT SUBMITTALS

1.6 Low-Emitting Materials - Adhesives and Sealants: Provide the quantity of each interior adhesive, sealant and sealant primer used.

1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives and Sealants: Use interior adhesives, sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Gypsum Board and Panel Adhesives: 50 g/L.
2. Architectural Sealants: 250 g/L.
3. Architectural Non-porous Sealant Primers: 250 g/L.
4. Architectural Porous Sealant Primers: 775 g/L.

1.8 DELIVERY, STORAGE AND HANDLING

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

1.9 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
2.2 GYPSUM BOARD, GENERAL

A. Recycled Content of Gypsum Panel Products:  Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Size:  Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers:  Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corp.
2. Georgia-Pacific Building Products.
4. USG Corporation.

B. Gypsum Board, Type X:  ASTM C 1396/C 1396M.

1. Thickness:  5/8 inch.
2. Long Edges:  Tapered.
3. Locations:  Typical for walls, soffits, and ceilings unless otherwise indicated.

C. Moisture- and Mold-Resistant Gypsum Board:  ASTM C 1396/C 1396M.  With moisture- and mold-resistant core and paper surfaces.

1. Core:  5/8 inch, Type X.
2. Long Edges:  Tapered.
3. Mold Resistance:  ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Locations:  Toilet Room walls and ceilings; shower room/locker room ceilings; inside face of exterior stud walls; and as indicated on the drawings.

2.4 TILE BACKING PANELS

A. Moisture- and Mold-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M or ASTM C 1178/C 1178M with moisture- and mold-resistant core and surfaces.

B. Cementitious Backer Units:  ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

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

   a. CertainTeed Corp.; FiberCement BackerBoard.

2. Thickness:  5/8 inch.
3. Mold Resistance:  ASTM D 3273, score of 10 as rated according to ASTM D 3274.
4. Location:  Use as substrate for all Ceramic or porcelain "Tile" installations.

2.5 TRIM ACCESSORIES

A. Interior Trim:  ASTM C 1047.

1. Material:  Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
PROJECT MANUAL FOR:
CP170621 - SCHOOL OF MUSIC NEW BUILDING
CP172801 - GENERAL SITE: SCHOOL OF MUSIC EXTENDED UTILITIES

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:
   1. Interior Gypsum Board: Paper.
   2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
   2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
      a. Use setting-type compound for installing paper-faced metal trim accessories.
   3. Fill Coat: For second coat, use setting-type, sandable topping compound.
   4. Finish Coat: For third coat, use setting-type, sandable topping compound.
   5. Skim Coat: For final coat of Level 5 finish, use [setting-type, sandable topping compound] [drying-type, all-purpose compound] [high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish].

D. Joint Compound for Tile Backing Panels:
   1. Moisture- and Mold-Resistant Gypsum Backing Board: As recommended by backing board manufacturer.
   2. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
   1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
   2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
E. Reference 079205 "Acoustic Sealant". Apply acoustic sealant at gypsum board where indicated on partition details and ceiling acoustic details.

F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 072100 "Thermal Insulation."

H. Neoprene Pad: Bridge Quality Neoprene Bearing Pad. 1/2 inch thick as shown on drawings.

I. Sound Barrier Mullion Trim Cap: Provides sound transmission control at curtain wall.

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. MULL-it-OVER Products, Sound barrier trip cap systems.

2. Double-Sided Installations: STC 60 or higher.

3. Allow for thermal movements from ambient and surface temperature changes.

4. Profiles: 60 Classic Mullion Trim Cap and 60 Wide Mullion Trim Cap. Refer to drawings for locations of each.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Acoustic Partitions and Ceilings: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer’s written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: As indicated on Drawings for walls, soffits and ceilings.
2. Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

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

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer’s written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 APPLYING TILE BACKING PANELS

A. Moisture- and Mold-Resistant Backing Board: Comply with manufacturer’s written installation instructions and install at locations indicated to receive tile, unless otherwise indicated. Install with 1/4-inch gap where panels abut other construction or penetrations.

B. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use [at exposed panel edges] <Insert requirements>.
3. L-Bead: Use where indicated.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 2: Where indicated on Drawings, including but not limited to:
   a. Ceiling plenum areas, concealed areas.
   b. No primer of paint are required at concealed conditions unless otherwise indicated.

2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
3. Level 5: [Where indicated on Drawings] <Insert locations>.
   a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

E. Moisture- and Mold-Resistant Backing Board: Finish according to manufacturer's written instructions.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

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

END OF SECTION 092900
SECTION 093000 - TILING

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. Glazed ceramic wall tile.
   2. Porcelain floor tile.
   3. Waterproof membrane.

B. Related Sections:
   1. Section 079200 "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
   2. Section 092900 "Gypsum Board" for tile backing board.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.


C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required. For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.
   2. Full-size units of each type of trim and accessory for each color and finish required.
   3. Metal edge strips in 6-inch lengths.
1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was manufactured within 500 miles of project site. Document material cost of each Product.
   1. Ceramic tile.
   2. Porcelain tile

D. Low-Emitting Materials - Paints and Coatings: Include manufacturer's printed statement of VOC content in g/l and Material Safety Data Sheet for each coating applied with the weather barrier.
   1. Provide quantity take offs for each coating applied within the weather barrier.

E. Product Certificates: For each type of product, signed by product manufacturer.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives and Grouts: Use interior adhesives and grouts that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Ceramic Tile Adhesives: 65 g/L.

B. Low-Emitting Materials - Flooring Systems: Use tile that is certified as compliant with the FloorScore standard by an independent third party.

C. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

D. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

E. Preinstallation Conference: Conduct conference at Project site.
   1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.
D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer’s written instructions.

B. Contractor to test concrete slab for moisture content and certify that slab is suitable for product installation. Contractor shall provide moisture barrier applied to concrete if needed in order to provide a fully warrantable installation.

1.9 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum >0.42.

1.10 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

1.11 TILE PRODUCTS

A. Tile Type [TL2 and TL3]: Unglazed porcelain floor tile.
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. Marazzi USA, Sistem_N


3. Face Size:
   a. (TL2): 12 x 24 inches
   b. (TL3): 6 x 24 inches

4. Face: Plain with square edges.


6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.

7. Grout Color: As selected by Architect from manufacturer's full range.

B. Tile Type [TL-1]: Glazed wall tile.

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. Daltile, Natural Hues on Eco-Body


3. Face: Pattern of design indicated, with manufacturer's standard edges.

4. Finish: Bright, opaque

5. Tile Color and Pattern: As selected by Architect from manufacturer's full range.

6. Grout Color: As selected by Architect from manufacturer's full range.


1.12 WATERPROOF MEMBRANE

A. General: Manufacturer’s standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.


1. Products: Subject to compliance with requirements, provide one of the following:
   b. MAPEI Corporation; Mapelastic HPG with MAPEI Fiberglass Mesh.

C. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. C-Cure; Pro-Red Waterproofing Membrane 963.
   b. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

1.13 SETTING MATERIALS

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. C-Cure.
   b. Laticrete International, Inc.
   c. MAPEI Corporation.
   d. TEC; a subsidiary of H. B. Fuller Company.

2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

1.14 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. C-Cure
   b. Laticrete-International, Inc.
   c. MAPEI Corporation.
   d. TEC,a subsidiary of H.B. Fuller Company

2. Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

1.15 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Metal Flooring Transition Strips: Provide at edge conditions of flooring. Provide product as indicated on drawings. Coordinate size of transition strip with thickness of tile.

C. Temporary Protective Coating: Either product indicated below that is formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.

1. Petroleum paraffin wax, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg F per ASTM D 87.
2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.

D. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

E. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Bonsal American; an Oldcastle company; Grout Sealer.
   b. Bostik, Inc.; CeramaSeal [Grout & Tile Sealer] [Magic Seal] [Silox 8] [Siloxane 220].
   c. C-Cure; Penetrating Sealer 978.
   d. Custom Building Products; [Surfaceguard] [Grout and Tile] [Grout] Sealer.
   f. MAPEI Corporation; KER [003, Silicone Spray Sealer for Cementitious Tile Grout] [004, Keraseal Penetrating Sealer for Unglazed Grout and Tile].
   g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
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F. Moisture Barrier: If required due to concrete slab moisture content exceeding manufacturer recommendations, provide Mapei Planiseal EMB or equal approved by architect.

1.6 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers’ written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 2 - EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

   a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
   b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

2.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Concrete Substrates: Prepare according to ASTM F 710.

   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.

4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations
   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate meeting manufacturer recommendations.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level within manufacturer specifications.

C. Installer shall certify that the slab is suitable for product installation prior to starting installation.

D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

E. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

2.3 TILED INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
   a. Tile floors in wet areas.
   b. Tile floors composed of tiles 8 by 8 inches or larger.
   c. Tile floors composed of rib-backed tiles.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.

3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

2. Paver Tile: [1/4 inch] [3/8 inch].
3. Wall Tile: 1/16 inch.

G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

I. Metal Edge Strips: Install at locations indicated.

J. Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer’s written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

2.4 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer’s written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

2.5 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-Portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer’s written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.
2.6   INTERIOR TILE INSTALLATION SCHEDULE

A.   Interior Floor Installations, Concrete Subfloor:

   1.   Tile Installation F122: Thin-set mortar on waterproof membrane; TCA F122.
   
      a.   Tile Type: TL2 and TL3
      b.   Thin-Set Mortar: Latex-portland cement mortar.
      c.   Grout: Polymer-modified sanded grout.

B.   Interior Wall Installations, Metal Studs or Furring:

   1.   Tile Installation W244: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA W244.

      a.   Tile Type: TL1.
      b.   Thin-Set Mortar: Latex-portland cement mortar.
      c.   Grout: Polymer-modified unsanded grout.

END OF SECTION 093000
SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 panels and exposed suspension systems for ceilings.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.

2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.

2. Structural members to which suspension systems will be attached.

3. Size and location of initial access modules for acoustical panels.

4. Items penetrating finished ceiling including the following:

   a. Lighting fixtures.

   b. Air outlets and inlets.

   c. Speakers.

   d. Sprinklers.

   e. Access panels.

5. Perimeter moldings.

B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
D. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive, sealant, and sealant primer.

1. Provide quantity take offs for each adhesive, sealant, and sealant primer.

E. Low-Emitting Materials - Paints and Coatings: Include manufacturer's printed statement of VOC content in g/l and Material Safety Data Sheet for each interior paint and coating.

F. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

G. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives and Sealants: Provide the quantity of each interior adhesive, sealant and sealant primer used.

B. Low-Emitting Materials - Paints and Coatings: Provide the quantity of each interior finish coating, paint, and primer used.

C. Maintenance Data: For finishes 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. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
3. Hold-Down Clips: Equal to 2 percent of quantity installed.
4. Impact Clips: Equal to 2 percent of quantity installed.

1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives and Sealants: Use interior adhesives, sealants, and sealant primers that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Multipurpose Construction Adhesives: 70 g/L.
2. Architectural Sealants: 250 g/L.
3. Architectural Non-porous Sealant Primers: 250 g/L.
4. Architectural Porous Sealant Primers: 775 g/L.


1. Flats and Primers: 50 g/L.
2. Non-Flat: 150 g/L.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

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: Comply with ASTM E 1264 for Class A materials.
   2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:
   1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
   2. Suspension System: Obtain each type from single source from single manufacturer.

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

C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.

D. Acoustical Panel Standard: Provide manufacturer’s standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
   1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.

E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
   1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

F. Reference detail N1/A042 and Reflected Ceiling Plans for Acoustic Barrier Ceiling CLG1 locations.
2.3 ACOUSTICAL PANELS [AC1]

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Tectum Inc.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Product: Armstrong Ultima ceiling panel

C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with fiberglass-fabric overlay on face.

D. Color: White.

E. LR: Not less than 0.87.

F. NRC: Within range 0.65-0.70

G. CAC: Not less than 35.

H. AC: Not less than 170.

I. Edge/Joint Detail: Square Tegular.

J. Thickness: 7/8 inch.

K. Modular Size: 24 by 24 inches.

L. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS [AC2]

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. Tectum Inc.
3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Product: Armstrong Ultima ceiling panel

C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type IV, mineral base with membrane-faced overlay; Form 2, water felted; with fiberglass-fabric overlay on face.

D. Color: White.
E. LR: Not less than 0.87.
F. NRC: Not less than 0.80.
G. CAC: Not less than 35.
H. AC: Not less than 170.
I. Edge/Joint Detail: Square Tegular.
J. Thickness: 7/8 inch.
K. Modular Size: 24 by 48 inches.

2.5 ACOUSTICAL PANELS [AC3]

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries or comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.


C. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:

1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay.

D. Color: White.
E. NRC: Not less than 0.90.
F. Edge/Joint Detail: Square
G. Thickness: 7/8 inch.
H. Modular Size: 48 by 96 inches
I. Recycle Content: Post-Consumer - 12 percent; Pre-Consumer - 59 percent

2.6 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to [five] <Insert safety factor> times that imposed by ceiling construction, as determined by testing according to ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
   a. Type: anchors.
   b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.

2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to [10] <Insert safety factor> times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch-diameter wire.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.

F. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.

G. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

H. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in place.

2.7 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. or comparable product by one of the following:
   1. Armstrong World Industries, Inc.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Wide-Face, Capped, Double-Web, Fire-Rated, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 coating designation; with prefinished 02/11-inch-wide metal caps on flanges.

C. Narrow-Face, Single-Web, Extruded-Aluminum Suspension System: Main and cross runners formed from extruded aluminum to produce structural members with 9/16-inch- wide faces.
   2. Face Design: Screw-slot profile.
   3. Face Finish: Painted white.
4. Reveal Finish: Painted white.
   a. 15/16 Prelude XL [AC1 and AC2]
   b. Grouping Frames Kit (AC3)

2.8 METAL EDGE MOLDINGS AND TRIM

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. or comparable product by one of the following:
   1. Armstrong World Industries, Inc.
   2. Chicago Metallic Corporation.
   3. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide [stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member] -<Insert description>.
   3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
   1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
   2. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C 635/C 635M and 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, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

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

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by braking, countering, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.

2. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113
SECTION 096248 – RESILIENT WOOD FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Resiliently-supported plywood sub-floors for music rehearsal, practice, instruction, and performance spaces. Sub Floor Type FLR-1, FLR-2 and FLR-3 as indicated on Drawing A042.

1.2 SYSTEM DESCRIPTION

A. Resilient floor system – FLR-1

1. The resilient sub-floor system shall consist of 3/4” high x 2” x 2” isolation pads @ 16” on center each way. The mounts shall be held in place with a construction adhesive approved by the mount manufacturer. Additional pads at the perimeters of the room may be required to prevent excessive deflection.

2. Two layers of 3/4” interior tongue and groove underlayment plywood shall be laid on top of the mounts with joints occurring over the mounts. The plywood layers shall be glued one sheet to another horizontally and glued to the mounts using high-quality construction adhesives approved by the respective materials’ manufacturers. Screw along the perimeter at 12” on center and staple 12” on center in the field. Joints of the two plywood layers shall stagger one foot minimum.

3. The finish flooring shall be as specified on the architectural finish schedule, glued to the plywood sub-floor. Nailing techniques and perimeter expansion detailing shall be determined and warranted by installing contractor. Any variations from the described approach shall be contingent upon approval by the Acoustics in cooperation with the Architect.

B. Resilient floor system – FLR-2

1. Refer to the drawings for differences between FLR-2 and FLR-1. Except where differences are shown on the drawings, construct FLR-2 similarly to FLR-1. FLR-2 includes four layers plywood instead of two.

C. Resilient floor system – FLR-3

1. Refer to the drawings for differences between FLR-3 and FLR-1. Except where differences are shown on the drawings, construct FLR-3 similarly to FLR-1.

2. The finish flooring shall be tongue and groove hardwood flooring, as specified on the architectural finish schedule. Nailing techniques and perimeter expansion detailing shall be determined and warranted by installing contractor. Any variations from the described approach shall be contingent upon approval by the Acoustics in cooperation with the Architect.

1.3 SUBMITTALS

A. Submit shop drawings showing complete details including all dimensions, materials, finishes, mounting hardware and other pertinent information as may be requested.

1.4 QUALITY ASSURANCE

A. Mock-ups: Prior to installation of all resilient wood floors, install FLR-1 in one room ahead of schedule at location on site mutually agreed upon by Architect, Acoustics Consultant, Owner and Contractor. Include in mock-up materials, details, accessories, and techniques that will be used in construction of all floors. Acoustic Consultant shall review mock-up installation. Make changes or corrections as directed by Acoustic Consultant and Architect. After final review of mock-up, retain and use as standard of quality and workmanship for all remaining Resilient Wood Flooring installation.
PART 2 - PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. Acceptable 3/4" pads:

1. Super W Pad, 50 durometer by Mason Industries, Hollis, NY
2. KIP Pad with equivalent of 50 durometer by Kinetics Noise Control, Dublin, OH

B. Plywood Grade B or higher as required to avoid warped wood, meeting the necessary fire-rating.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before commencing installation, examine the substrate surrounding conditions to insure that there is nothing to prevent proper and timely execution of the installation. Start of work shall indicate acceptance of the substrate and surrounding conditions.

3.2 INSTALLATION

A. Install items plumb (or as indicated on the contract documents), straight, square, level and in their proper elevation, place and location.

B. Plywood flooring shall not warp or bend more than +/- ¼" at perimeter of finished floor. At FLR-1 and FLR-2, provide higher grade plywood or stiffeners under the plywood or at its perimeter as necessary to maintain a flat surface, while ensuring that no rigid part of the subfloor contacts the floor slab or the walls.

C. Maintain a continuous 3/8" gap +/- 1/8" at the full perimeter of the subfloor. Perimeter Isolation Board or a similar resilient material may be applied to the walls to help prevent rigid contact between the subfloor and the walls.

D. Provide 1/2" thick Acoustic Batt Insulation in the cavity between the plywood and the concrete.

E. All work shall be complete in every detail, and the finished work shall be clean and adjusted for the Architect prior to final acceptance.

END OF SECTION
SECTION 096250 – FLOATED CONCRETE FLOOR

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS
A. This section specifies the floated concrete floor for sound isolation. This specification requires the use of the lift-slab system. Floated jack-up floors for locations listed as sub floor type FLR-3 where indicated on Drawing A042.

1.2 SECTION INCLUDES
A. The Work of this Section includes all labor, materials, equipment, and services necessary to provide floated floor to the extent shown on the drawings and as specified in this section. Include all spring isolators, reinforcing steel, floor drains, spools and sleeves, perimeter board, bond-breaker and other accessories as needed for a complete installation. Verify all dimensions; coordinate with other trades to complete the work on schedule and alert other trades of potential interruptions of their work.

1.3 RELATED SECTIONS
A. Division 3 – Concrete
B. Division 13 -- Special Construction

1.4 QUALITY ASSURANCE
A. The responsibility for entire floated floor systems shall be by a single contractor. Concrete for floated floors and reinforcing steel shall be provided by others, but shall be placed under the supervision of the contractor responsible for the work of this section. A representative of the isolation materials manufacturer shall install or supervise the installation of isolation materials, perimeter boards, reinforcing steel, floor drains, bond-breaker, form work, concrete pour and raising of the floor.

B. Contractor shall lay out isolators to provide specified minimum deflection under dead load, including the dead load of any wall and ceiling assemblies carried by the floated floor.

1.5 STANDARDS
A. American Association of Safety and Highway Officials (AASHO).

1.6 SUBSTITUTIONS
A. Requests for deviation from this specification shall be subject to review by the Acoustics Consultant at the expense of the contractor requesting the change.

1.7 SUBMITTALS
A. Shop Drawings: The Contractor shall have vibration manufacturer prepare submittal drawings that include layout, section, and transition details, load conditions, isolator natural frequency and load deflection curves, and construction sequence. Indicate specific isolator selections and locations. Contractor shall transmit submittal package to the Design Team for approval.

B. Load and deflection curves for all isolators. At load, isolator shall maintain uniform deflection of the floating floor.
C. Certification that the elastomeric compound meets the listed AASHO bridge-bearing specifications.

D. Dynamic frequency test verifying the isolator's natural frequency.

E. Report from the specialty contractor or isolator manufacturer's representative stating the extent of observation of the floor installation; their findings, recommendations and corrective measures taken; and summary statement whether the installation is complete and correct in all respects.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

   FS System

B. Kinetics Noise Control, Dublin Ohio.
   LSM System

C. Amber-Booth, Houston, Texas.
   ASFF System

2.2 ISOLATORS

A. Housing layout before concrete pour consisting of a welded steel housing with plywood cover laid out per manufacturer submittal drawing; housing development rebar interconnecting the housing, rebar as required for isolated concrete slab strength; slab and reinforcement design by qualified engineer;

B. Casting or weldments consisting of an internally threaded outer housing complete with lugs to support the reinforcing system. The inner inverted cup shaped housing shall be externally threaded. The springs are compressed and the floor lifted by turns of the internal housing. Springs shall be seated in neoprene cups and housings shall have removable cover plates. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.

C. Spring deflections shall be a minimum of 1.0".

2.3 PLASTIC SHEETING

A. 6 mm polyethylene film.

2.4 PERIMETER ISOLATION BOARD

A. 1/2" minimum thickness, semi-rigid, or glass fiber board.

2.5 ACOUSTIC JOINT SEALANT

A. As specified in Acoustic Joint Sealant specification.

PART 3 - EXECUTION
3.1 PREPARATION

A. Clean and prepare substrate.

3.2 INSTALLATION

A. Cement perimeter isolation board around all walls and columns.
B. Place sheeting over entire structural floor and running up the isolation boards, tape all seams and at all connections to walls.
C. Place isolators in accordance with shop drawings prepared by the isolation manufacturer.
D. Place reinforcing steel as shown and pour concrete monolithically. Finish in accordance with specifications for concrete.
E. After concrete is cured, use jackscrews to raise the floor at least 2" under the supervision of the manufacturer's representative.
F. Grout all jackscrew holes.
G. Remove all grout or rigid materials that bridge past isolation board.
H. Provide continuous bead of sealant at perimeter of jackup slab above perimeter isolation board.

3.3 FIELD QUALITY CONTROL

A. The floated floors shall be completely free from rigid contact with any part of the building structure or un-isolated building finish.

END OF SECTION
SECTION 096400 - WOOD 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. Section Includes:
   1. Factory-finished wood flooring.

B. Related Requirements:
   1. Section 096248 "Resilient Wood Flooring" for resiliently supported sub-floors

1.3 ACTION SUBMITTALS

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

B. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include expansion provisions and trim details.

C. Samples for Verification: For each type of wood flooring and accessory, with stain color and finish required, approximately 12 inches long and of same thickness and material indicated for the Work and showing the full range of normal color and texture variations expected.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

C. Rapidly Renewable Materials: Manufacturer's documentation declaring type and percentage of rapidly renewable materials contained in each product. Document material cost of each rapidly renewable component.

D. Certified Wood: For certified wood and wood products provide documentation of certified status of forest. Documentation to contain supplier's Chain of Custody number, identify each certified product, and manufacturer on line item basis. Provide percentage and cost of each certified wood component. Submit vendor's invoice for certified wood and wood products.

E. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.
1. Provide quantity take offs for each adhesive.

F. Low-Emitting Materials - Flooring Systems: Documentation from independent testing agency indicating that wood flooring is certified as compliant with FloorScore standard.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide quantity of each interior adhesive used.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Certified Wood: Provide wood and wood products produced from wood obtained from forests certified by FSC-accredited certification body to comply with FSC 1.2, "Principles and Criteria."

1. Wood flooring.

C. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:

1. Wood Flooring Adhesives: 100 g/l.

D. Low-Emitting Materials - Flooring Systems: Use wood flooring certified as compliant with FloorScore standard.

E. Hardwood Flooring: Comply with NOFMA's "Official Flooring Grading Rules" for species, grade, and cut.

1. Certification: Provide flooring that carries NOFMA grade stamp on each bundle or piece.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood flooring materials in unopened cartons or bundles.

B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.

C. Store wood flooring materials in a dry, warm, ventilated, weathertight location.

1.8 PROJECT CONDITIONS

A. Conditioning period begins not less than seven days before wood flooring installation, is continuous through installation, and continues not less than seven days after wood flooring installation.

1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants in spaces to receive wood flooring during the conditioning period.

2. Wood Flooring Conditioning: Move wood flooring into spaces where it will be installed, no later than the beginning of the conditioning period.

a. Do not install flooring until it adjusts to relative humidity of, and is at same temperature as, space where it is to be installed.
b. Open sealed packages to allow wood flooring to acclimatize immediately on moving flooring into spaces in which it will be installed.

B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.

C. Install factory-finished wood flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 FIELD-FINISHED WOOD FLOORING

A. Solid-Wood Flooring [WF1]: Kiln dried to 6 to 9 percent maximum moisture content, tongue and groove and end matched, and with backs channeled.

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. Carlisle Wide Plank Floors.
   b. Oregon Lumber Company.
   c. WD Flooring, LLC.

2. Species and Grade: White Oak.
5. Face Width: 5-1/8 inches.
7. Finish: Transparent.

B. Transparent Finish System: Complete water-based polyurethane system of compatible components that is recommended by finish manufacturer for application indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basic Coatings, Inc.
   b. BonaKemi USA Inc.
   c. Dura Seal, Sherwin-Williams Company (The).
   d. Hillyard, Inc.
   e. Polo-Plaz Coatings; National Coatings Company.

2. Floor Sealer: Pliable, penetrating type.
3. Finish Coats: Formulated for multicoat application on wood flooring.

C. Wood Filler: Compatible with finish system components and recommended by filler and finish manufacturers for use indicated. If required to match approved Samples, provide pigmented filler.

2.2 ACCESSORY MATERIALS

A. Wood Flooring Adhesive: Mastic recommended by flooring and adhesive manufacturers for application indicated.

C. Metal Flooring Transition Strips: Provide at edge conditions of flooring. Provide product as indicated on drawings. Coordinate size of transition strip with thickness of flooring.

D. Cork Expansion Strip: Composition cork strip at expansion spaces at walls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood flooring.

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

C. Refer to Section 096248 "Resilient Wood Flooring" for resiliently-supported plywood sub-floor for plywood underlayment.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

B. Broom or vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

A. Comply with flooring manufacturer’s written installation instructions, but not less than applicable recommendations in NWFA’s "Installation Guidelines: Wood Flooring."

B. Subfloor: Install according to requirements in Section 096248 "Resilient Wood Flooring".

C. Provide expansion space at walls and other obstructions and terminations of flooring of not less than 3/4 inch.

3.4 FIELD FINISHING

A. Machine-sand flooring to remove offsets, ridges, cups, and sanding-machine marks that would be noticeable after finishing. Vacuum and tack with a clean cloth immediately before applying finish.

1. Comply with applicable recommendations in NWFA's "Installation Guidelines: Wood Flooring."

B. Fill open-grained hardwood.

C. Fill and repair wood flooring seams and defects.

D. Apply floor-finish materials in number of coats recommended by finish manufacturer for application indicated, but not less than one coat of floor sealer and three finish coats.

1. Apply stains to achieve an even color distribution matching approved Samples.
2. For water-based finishes, use finishing methods recommended by finish manufacturer to minimize grain raise.

E. Cover wood flooring before finishing.

F. Do not cover wood flooring after finishing until finish reaches full cure, and not before seven days after applying last finish coat.

3.5 PROTECTION

A. Protect installed wood flooring during remainder of construction period with covering of heavy kraft paper or other suitable material. Do not use plastic sheet or film that might cause condensation.

1. Do not move heavy and sharp objects directly over kraft-paper-covered wood flooring. Protect flooring with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096400
SECTION 096513 - RESILIENT BASE AND 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. Resilient base.
   2. Resilient transition strips.

B. Related Sections:
   1. Section 096516.13 "Linoleum Flooring" for linoleum floor coverings.
   2. Section 096813 "Tile Carpeting"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

C. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.

D. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

   1. Provide quantity take offs for each adhesive.

B. Low-Emitting Materials - Flooring Systems: Documentation from an independent testing agency indicating that resilient base and accessories are certified as compliant with the FloorScore standard.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.
1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Cove Base Adhesives: 50 g/L.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

2.2 THERMOSET-RUBBER BASE [RB-1]

A. Basis-of-Design Product: Subject to compliance with requirements, provide Roppe Corporation, USA, 700 Series or comparable products by one of the following:

1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
2. Flexco.
3. Johnsonite; A Tarkett Company.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous), PVC-free.

1. Style and Location:
   a. Style A, Straight: Provide in areas as indicated on drawingst.

C. Thickness: 0.125 inch.

D. Height: 4 inches.
E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Colors: As selected by Architect from full range of industry colors.

I. Resilient Transition Strips
   1. Provide in locations as indicated on drawings.
   2. Provide options of shape profiles for architect review and approval.
   3. Color selected by architect from manufacturer full range.

2.3 INSTALLATION MATERIALS

A. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products
   and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture
   content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other
      Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits
      that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient
   products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove
   bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are the same temperature as the space where they are to be
   installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into
      spaces where they will be installed.

D. Immediately before installation, clean substrates to be covered by resilient products.
3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
      a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513
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.
B. Related Requirements:
   1. Section 096513 - Resilient Base and Accessories.

1.2 SUMMARY
A. Section includes linoleum sheet flooring.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: For each type of linoleum flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.
C. Samples: For each exposed product and for each color and pattern specified in manufacturer's standard size, but not less than 6-by-9-inch sections.
   1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
D. Heat-Welded Seam Samples: For each linoleum flooring product and welding bead color and pattern combination required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to rigid backing and prepared by Installer for this Project.
E. Product Schedule: For linoleum flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.
B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.
C. Rapidly Renewable Materials: Manufacturer's documentation declaring type and percentage of rapidly renewable materials contained in each product. Document material cost of each rapidly renewable component.
1. Rosin, Linseed Oil, Limestone and other core materials.

D. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

1. Provide quantity take offs for each adhesive.

E. Low-Emitting Materials - Flooring Systems: Documentation from independent testing agency indicating that linoleum flooring is certified as compliant with FloorScore standard.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of linoleum flooring to include in maintenance manuals.

B. Low-Emitting Materials - Adhesives: Provide quantity of each interior adhesive used.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for flooring installation.

1. Engage an installer who employs workers for this Project who are trained or certified by flooring manufacturer for installation techniques required.

B. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:

1. Sustain 1195 Marmoleum Sheet Adhesive by Forbo Flooring, Inc.: 0 g/L (calculated).


1.7 DELIVERY, STORAGE, AND HANDLING

A. Store flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 65 deg F or more than 90 deg F.

1. Sheet Flooring: Store rolls upright.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive flooring during the following time periods:

1. 72 hours before installation.
2. During installation.
3. 72 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during flooring installation.
D. Close spaces to traffic for 72 hours after flooring installation.

E. Install flooring after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For linoleum flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LINOLEUM SHEET FLOORING [LN1]

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc. or comparable product by one of the following:

1. Forbo Industries, Inc.
2. Johnsonite; A Tarkett Company.

B. Linoleum Sheet Flooring: ASTM F 2034, Type I, linoleum sheet with backing.

1. Roll Size: In manufacturer's standard length but not less than 78 inches wide.
2. Backing: Jute

C. Thickness: 0.006 inch.


2. Color: Match linoleum flooring.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by linoleum flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit products and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by linoleum flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of flooring.

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

3.2 PREPARATION

A. Prepare substrates according to linoleum flooring manufacturer's written instructions to ensure adhesion of flooring.

B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by linoleum flooring manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by linoleum flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
   4. Moisture Testing: Perform tests recommended by linoleum flooring manufacturer, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Installer shall certify that the slab is suitable for product installation prior to starting installation.

D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

E. Do not install flooring until it is the same temperature as space where it is to be installed.
   1. At least 72 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

F. Immediately before installation, sweep and vacuum clean substrates to be covered by flooring.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions for installing flooring.

B. Scribe and cut flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings.

C. Extend flooring into toe spaces, door reveals, closets, and similar openings.

D. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on flooring as marked on substrates. Use chalk or other nonpermanent marking device.

E. Install flooring on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
F. Adhere flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

G. Heat-Welded Seams: For seamless installation, comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.

H. Moisture Barrier: Contractor to provide and install manufacturer recommended moisture barrier if necessary.

3.4 LINOLEUM SHEET FLOORING INSTALLATION

A. Unroll linoleum sheet flooring and allow it to stabilize before cutting and fitting.

B. Lay out linoleum sheet flooring as follows:
   1. Maintain uniformity of flooring direction.
   2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
   3. Match edges of flooring for color shading at seams.
   4. Avoid cross seams.
   5. Eliminate deformations that result from hanging method used during drying process (stove bar marks).

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting linoleum flooring.

B. Perform the following operations immediately after completing linoleum flooring installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect linoleum flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from linoleum flooring before applying liquid floor polish.
   1. Apply two coat(s).

E. After allowing drying room film (yellow film caused by linseed oil oxidation) to disappear, cover linoleum flooring until Substantial Completion.

END OF SECTION 096543
SECTION 096813 - TILE CARPETING

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 modular, tufted carpet tile.

B. Related Requirements:

1. Section 033000 “Cast-In-Place Concrete” for Alkalinity and Adhesion and Moisture Testing of the slab.
2. Section 096513 “Resilient Base and Accessories” for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer’s written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Type of subfloor.
3. Type of installation.
4. Pattern of installation.
5. Pattern type, location, and direction.
6. Type, color, and location of edge, transition, and other accessory strips.
7. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer’s name, material description, color, pattern, and designation indicated on Drawings and in schedules.


D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

C. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

D. Low-Emitting Materials - Adhesives: Include manufacturer’s printed statement of VOC content in g/l for each interior adhesive.
   1. Provide quantity take offs for each adhesive.

E. Low-Emitting Materials - Flooring Systems: Manufacturer’s documentation that carpet meets the testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program.

F. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

G. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.

B. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer’s recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

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. Carpet Tile: Full-size units equal to [5] <Insert number> percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

B. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Indoor Carpet Adhesives: 50 g/l.

C. Low-Emitting Materials - Flooring Systems: Use carpet that meets the testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program.

D. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.9 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

E. Contractor to test concrete slab for moisture content and certify that slab is suitable for product installation. Contractor shall provide moisture barrier applied to concrete if needed in order to provide a fully warrantable installation.

1.10 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.

3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE [CT1]

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

1. Bentley, Tech Upd8

B. Color: As selected by Architect from manufacturer's full range.

C. Pattern: 4TDT40A0K.

D. Fiber Content: 100 percent nylon 6, 6.

E. Pile Characteristic: Tufted Textured Loop pile.

F. Density: 5,478 oz./cu. yd.

G. Pile Thickness: 0.205 inches for finished carpet tile according to ASTM D 6859.
H. Stitches: 10.5 stitches per inch
I. Gage: 1/12 ends per inch
J. Total Weight: 73 oz./sq. yd. for finished carpet tile.
K. Backing System: NexStep Cushion Tile
L. Size: 18 by 36 inches.
M. Applied Soil-Resistance Treatment: Manufacturer's standard material XTERA
N. Performance Characteristics: As follows:
   1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.

2.2 CARPET TILE [CT3]
A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   1. Bentley, Tech Upd8
B. Color: As selected by Architect from manufacturer's full range.
C. Pattern: 4TDT40AA0K.
D. Fiber Content: 100 percent nylon 6, 6.
E. Pile Characteristic: Tufted Textured Loop pile.
F. Density: 5,478 oz./cu. yd.
G. Pile Thickness: 0.205 inches for finished carpet tile according to ASTM D 6859.
H. Stitches: 10.5 stitches per inch
I. Gage: 1/12 ends per inch
J. Total Weight: 73 oz./sq. yd. for finished carpet tile.
K. Primary Backing/Back coating: Manufacturer's standard composite materials, AFIRMA Hardback-Tile.
L. Size: 18 by 36 inches.
M. Applied Soil-Resistance Treatment: Manufacturer's standard material XTERA
N. Performance Characteristics: As follows:
   1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
   1. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
   2. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

3.2 PREPARATION

A. Concrete Substrates: Prepare according to ASTM F 710.
   1. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
   2. Moisture Testing: Proceed with installation only after substrates pass testing according to carpet tile manufacturer's written recommendations.
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate meeting manufacturer recommendations.

B. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum relative humidity level within manufacturer specifications.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813
SECTION 096816 - ROLL CARPETING

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. Tufted textured loop carpet.

B. Related Requirements:
   1. Section 096513 “Resilient Base and Accessories” for resilient wall base and accessories installed with carpet.
   2. Section 096813 “Tile Carpeting” for modular carpet tiles.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics and durability.
   2. Include manufacturer's written installation recommendations for each type of substrate.

B. Shop Drawings: For carpet installation, showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet.
   2. Carpet type, color, and dye lot.
   3. Seam locations, types, and methods.
   4. Type of subfloor.
   5. Type of installation.
   6. Pattern type, repeat size, location, direction, and starting point.
   7. Pile direction.
   8. Transition details to other flooring materials.

C. Samples for Verification: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
   1. Carpet: 12-inch- square Sample.
   2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- long Samples.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer’s certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

C. Low-Emitting Materials - Adhesives: Include manufacturer’s printed statement of VOC content in g/l for each interior adhesive.
   1. Provide quantity take offs for each adhesive.

D. Low-Emitting Materials - Flooring Systems: Manufacturer’s documentation that carpet meets the testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program.

E. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.

B. Maintenance Data: For carpet to include in maintenance manuals. Include the following:
   1. Methods for maintaining carpet, including cleaning and stain-removal products and procedures and manufacturer’s recommended maintenance schedule.
   2. Precautions for cleaning materials and methods that could be detrimental to carpet.

1.6 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.

1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:
   1. Indoor Carpet Adhesives: 50 g/l.

B. Low-Emitting Materials - Flooring Systems: Use carpet that meets the testing and product requirements of the Carpet and Rug Institute’s Green Label Plus program.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI’s “CRI Carpet Installation Standard.”

B. Deliver carpet in original mill protective covering with mill register numbers and tags attached.
1.9 FIELD CONDITIONS

A. Comply with CRI’s “CRI Carpet Installation Standard” for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet over concrete slabs until slabs have cured, are sufficiently dry to bond with adhesive, and have pH range recommended by carpet manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet, install carpet before installing these items.

1.10 WARRANTY

A. Special Warranty for Carpet: Manufacturer agrees to repair or replace components of carpet installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet due to unusual traffic, failure of substrate, vandalism, or abuse.

2. Failures include, but are not limited to, the following:
   
a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
b. Loss of tuft bind strength.
c. Excess static discharge.
d. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TUFTED CARPET [CT4]

A. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Bentley Prince Street, Inc., Shapeshifter (4SET4)

B. Color: As selected by Architect from manufacturer’s full range.

C. Pattern: Shapeshifter, #4SET40620R

D. Fiber Content: 100 percent nylon 6, 6.

E. Fiber Type: Antron Lumena

F. Pile Characteristic: Tufted Textured Loop pile.

G. Density: 5,112 oz./cu. yd.

H. Pile Thickness: Total thickness 0.210 in

I. Stitches: 10.7 per inch.

J. Gage: 1/12 per inch
K. Total Weight: 50oz./sq. yd. for finished carpet.

L. Backing System: High Performance PC-Broadloom - 12 ft

M. Roll Width: 12 feet.

N. Performance Characteristics:

1. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" testing program.
2. Radiant Panel: Passes Class 1, >0.45 W/cm² (ASTM-E648)
3. Smoke Density: <450 dm Corrected (ASTM-E662), Flaming
4. Static: <3.5 kV (AATCC 134), Step
5. Flammability: Passes Methenamine Pill Test (CPSC-FF1-70)

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and is recommended or provided by carpet manufacturer.

1. VOC Content: 50 g/L or less.

C. Seam Adhesive: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

D. Metal Edge/Transition Strips: Extruded aluminum with brushed aluminum finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet performance.

B. Examine carpet for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

c. Perform additional moisture tests recommended in writing by adhesive and carpet manufacturers. Proceed with installation only after substrates pass testing.

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

3.2 PREPARATION

A. General: Comply with CRI's "CRI Carpet Installation Standard" and with carpet manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

3.3 CARPET INSTALLATION

A. Comply with CRI's "CRI Carpet Installation Standard" and carpet manufacturer's written installation instructions for the following:

1. Direct-glue-down installation.
2. Stair installation.

B. Comply with carpet manufacturer's written instructions and Shop Drawings for seam locations and direction of carpet; maintain uniformity of carpet direction and lay of pile. At doorways, center seams under the door in closed position.

C. Do not bridge building expansion joints with carpet.

D. Cut and fit carpet to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet manufacturer.

E. Extend carpet into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet as marked on subfloor. Use nonpermanent, nonstaining marking device.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet manufacturer.
2. Remove yarns that protrude from carpet surface.
B. Protect installed carpet to comply with CRI's "CRI Carpet Installation Standard."

C. Protect carpet against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods recommended in writing by carpet manufacturer and carpet adhesive manufacturer.

END OF SECTION 096816
SECTION 097200 - WALL COVERINGS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Heavy-duty synthetic textile wall covering.
   B. Related Sections:
      1. Division 09 Section "Interior Painting " for priming wall surfaces.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
   B. Samples for Verification: Memo size sample.

1.4 INFORMATIONAL SUBMITTALS
   A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.
   B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
   C. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.
      1. Provide quantity take offs for each adhesive.
   D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

1.5 Closeout Submittals:
   A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.
   B. Maintenance Data: For wall coverings to include in maintenance manuals.
1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Gypsum Board and Panel Adhesives: 50 g/L.

B. 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: As follows, per ASTM E 84:
   a. Flame-Spread Index: 25 or less.
   b. Smoke-Developed Index: 450 or less.

1.7 PROJECT 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 occupancy levels during the remainder of the construction period.

B. Lighting: Do not install wall covering until a permanent level of lighting 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.

1.8 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. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.

PART 2 - PRODUCTS

2.1 WALL COVERINGS

A. General: Provide rolls of each type of wall covering from same print run or dye lot.

2.2 HEAVY-DUTY SYNTHETIC TEXTILE WALL COVERING [WC1]

A. Wall-Covering Standard: Provide mildew-resistant wall coverings that comply with ASTM F 793 for Category V, Type II, Commercial Serviceability products.

1. Products: Subject to compliance with requirements, provide the following:

   a. Carnegie, Xorel, Meteor

B. Test Responses:
1. Colorfastness to Wet and Dry Crocking: Passes AATCC 8, Class 5
2. Colorfastness to Light: Passes AATCC 16A or AATCC 16E, Class 5, at 40 hours.

C. Width: 56 inches.

D. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.

2.3 ACCESSORIES

A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer.

B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "[Interior Painting]"<Insert Section title>" and recommended in writing by wall-covering manufacturer for intended substrate.

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.

1. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
2. Plaster: Allow new plaster to cure. Neutralize areas of high alkalinity. Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
3. Metals: If not factory primed, clean and apply metal as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
4. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
5. Painted Surfaces: Treat areas susceptible to pigment bleeding.

D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.

E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.
3.3 INSTALLATION

A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.

B. Cut wall-covering strips in roll number sequence. Change roll numbers at partition breaks and corners.

C. Install strips in same order as cut from roll or reversing every other strip, as recommended by wall-covering manufacturer.

D. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.

E. Match pattern 72 inches above the finish floor.

F. Install seams vertical and plumb at least 6 inches from outside corners and 6 inches from inside corners unless a change of pattern or color exists at corner. No horizontal seams are permitted.

G. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

H. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips.

3.4 CLEANING

A. Remove excess adhesive at finished 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 09720
SECTION 097723 - FABRIC-WRAPPED 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. Fabric sound absorbing wall panels.

B. Related Sections:

1. Section 097200 "Wall Coverings" for adhesively applied textile wall coverings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of fabric facing, panel edge, core material, and mounting indicated.

B. Shop Drawings: For fabric-wrapped wall panels. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.

1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.

C. Samples for Verification: For the following products, prepared on Samples of size indicated below:

1. Fabric: Memo size sample.
2. Core Material: 12-inch square Sample at corner.
3. Assembled Panels: Approximately 36 by 36 inches (900 by 900 mm), including joints and mounting methods.

a. Only one assembled fiberglass panel is required for review.
b. Fabric wrapped acoustic pegboard panel

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.
C. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

   1. Provide quantity take offs for each adhesive.

D. Product Certificates: For each type of fabric-wrapped wall panel, from manufacturer.

E. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.

B. Maintenance Data: For fabric-wrapped wall panels to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

   1. Multipurpose Construction Adhesives: 70 g/L.

B. Low-Emitting Materials - Composite Wood and Agrifiber Products: Use composite wood and agrifiber products that contain no added urea-formaldehyde resins on the interior of the building. Laminating adhesives used to fabricate such products shall also not contain added urea-formaldehyde resins.

C. Source Limitations: Obtain fabric-wrapped acoustical wall panels from single source from single manufacturer.

D. Fire-Test-Response Characteristics: Provide fabric-wrapped wall panels meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

   1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.

      a. Flame-Spread Index: 25 or less.

      b. Smoke-Developed Index: 450 or less.

   2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 285.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with fabric and fabric-wrapped, wall panel manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.

B. Deliver materials and panels in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.
1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fabric-wrapped wall panels 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. Lighting: Do not install fabric-wrapped wall panels until a permanent level of lighting is provided on surfaces to receive fabric-wrapped wall panels.

C. Air-Quality Limitations: Protect fabric-wrapped wall panels from exposure to airborne odors such as tobacco smoke, and install panels under conditions free from odor contamination of ambient air.

D. Field Measurements: Verify locations of fabric-wrapped wall panels and actual dimensions of openings and penetrations by field measurements before fabrication.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fabric-wrapped wall panels that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Fabric sagging, distorting, or releasing from panel edge.
   b. Warping of core.

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

PART 2 - PRODUCTS

2.1 FABRIC-WRAPPED WALL PANELS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Golterman & Sabo.

B. Fabric-Wrapped Wall Panel [AF1]:

3. Core: Fiberglass core of 6 to 7pcf.
4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
5. Edge Profile: Square.
6. Corner Detail in Elevation: Square with continuous edge profile indicated.
7. Reveals between Panels: Flush reveals as indicated on Drawings.
8. Facing Material: Carnegie Xorel, Meteor
   a. (AF1A): White 6427 705
   b. (AF1B): Black 6427 W769
   c. (AF1C): Gold 6427 720
9. Nominal Core Thickness: 1 inch.
10. Panel Width: As indicated on Drawings.
11. Panel Height: As indicated on Drawings.

D. Fabric-Wrapped Wall Panel [AF2]:

3. Core: Fiberglass core of 6 to 7 pcf.
4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
5. Edge Profile: Square.
6. Corner Detail in Elevation: Square with continuous edge profile indicated.
7. Reveals between Panels: Flush reveals as indicated on Drawings.
8. Facing Material: Carnegie Xorel, Meteor
   a. (AF2A): White 6427 705
   b. (AF2B): Black 6427 W769
   c. (AF2C): Gold 6427 720

9. Nominal Core Thickness: 2 inches.
10. Panel Width: As indicated on Drawings.
11. Panel Height: As indicated on Drawings.

E. Fabric-Wrapped Wall Panel [AF3]:

3. Core: Fiberglass core of 6 to 7 pcf.
4. Edge Construction: Manufacturer's standard chemically hardened core with no frame.
5. Edge Profile: Square.
6. Corner Detail in Elevation: Square with continuous edge profile indicated.
7. Reveals between Panels: Flush reveals as indicated on Drawings.
8. Facing Material: Carnegie Xorel, Meteor, White 6427 705
9. Nominal Core Thickness: 4 inches.
10. Panel Width: As indicated on Drawings.
11. Panel Height: As indicated on Drawings.

2.2 STRETCHED FABRIC ACOUSTICAL WALL PANEL (AF5)

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

2. Panel Size: As indicated on drawings
3. Stretching System: Polymer Extrusions
   a. Perimeter Edge Condition: Square
   b. Midwall Edge Condition: Square
   c. Outside Corner Edge Condition: Square with seam

4. Fabric:
   a. Acoustical Solutions, Acoustone Stretch Fabric
   b. Color: White

5. Refer to Elevations.
2.3 FABRICATION

A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.

B. Fiberglass Cores: Chemically harden core edges and areas of core where mounting devices are attached.

C. Facing Material: Apply fabric fully covering visible surfaces of panel; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
   1. Square Corners: Tailor corners.
   2. Fabrics with Directional or Repeating Patterns or Directional Weave: Mark fabric top and attach fabric in same direction so pattern or weave matches in adjacent panels.

D. Dimensional Tolerances of Finished Panels: Plus or minus 1/16 inch for the following:
   1. Thickness.
   2. Edge straightness.
   3. Overall length and width.
   4. Squareness from corner to corner.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fabric, fabricated panels, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of fabric-wrapped wall panels.

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

3.2 INSTALLATION

A. Install fabric-wrapped wall panels in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other panels, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.

B. Comply with fabric-wrapped, wall panel manufacturer's written instructions for installation of panels using type of mounting devices indicated. Mount panels securely to supporting substrate.

C. Align and level fabric pattern and grain among adjacent panels.

3.3 INSTALLATION TOLERANCES

A. Variation from Plumb and Level: Plus or minus 1/16 inch.

B. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.4 CLEANING

A. Clip loose threads; remove pills and extraneous materials.
B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer’s written instructions.

END OF SECTION 097723
SECTION 098421 – SPECIALTY ACOUSTIC PANELS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS
A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SUMMARY
A. Furnish and install Specialty Acoustic Panels as specified herein in locations and sizes as shown on drawings. Field verify all dimensions and mounting requirements.

1.3 RELATED SECTIONS
A. Submittals – 013300
B. Wood, Plastics and Composites - Division 06

1.4 DEFINITIONS
A. AU1 – Wood fiber abuse resistant sound absorbing wall panel
B. AU2 – Wall and ceiling two-dimensional sound diffusive panel.
C. AU3 – Architectural barrel sound diffusive panel.
D. AU4 – Architectural shaped sound diffusive panel.
E. AU5 – Surface mounted matte felt.
F. AF4 – Pegboard movable acoustic panel.

1.5 QUALITY ASSURANCE
A. Contractors’ Quality Assurance Responsibilities: Contractor is solely responsible for quality of the Work. Comply with the requirements specified herein.
B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction.

1.6 SUBMITTALS
A. Furnish submittals in accordance with requirements specified in Division 1.
B. Shop Drawings: Furnish shop drawings including plans, sections and elevations for the custom fabrication and installation of the Work. Show typical details of the conditions for every member, joint, anchorage and support in the system.
C. Samples:
   1. AU2 Panels: Submit to the Acoustic Consultant through the Architect, one typical module full section of custom diffuser by 24” high showing typical joinery and finish. Submit samples of finished panels including paint.
   2. AU3: Submit to the Acoustic Consultant through the Architect, one typical module full section of custom diffuser by 24” high showing typical joinery and finish. Sample should include
required stiffener. Submit samples of finished panels including paint.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specialty Acoustic Panel Manufacturer:
   1. AU1: Specialty Acoustic Panel Manufacturer:
      Tectum Wall Panels, Armstrong www.tectum.com
      Heraklith Magnesite-bound wood wool acoustic panels. Furnitz, Austria. www.heraklith.com
      Golterman and Sabo

   2. AU2: Kinetics Noise Control
      RPG Acoustics
      Or Approved Equal

   3. AU3: Golterman and Sabo
      Kinetics Noise Control
      RPG Acoustics

   4. AU4: Modular Arts
      Or approved equal.

   5. AU5: FitzFelt
      MDC Zintra Acoustic Panels
      unika vaev

2.2 MANUFACTURED UNIT

A. AU1 – Wood fiber abuse resistant sound absorbing wall panel
   1. Basis of design: Tectum by Armstrong
   3. 1" thick with C-40 mounting furring.
   4. Noise Reduction Coefficients: Panels shall meet or exceed the NRC listed below.

<table>
<thead>
<tr>
<th>Octave Band Center Frequency (Hertz)</th>
<th>Spray Thickness</th>
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<tr>
<td></td>
<td>125</td>
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<td>.32</td>
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</table>

B. AU2 – Diffusive Wall & Ceiling Panel: Two-Dimensional Quadratic Root Diffusor.
   1. Basis of design: Kinetics Noise Scatterbox Diffusor
   2. The diffuser shall work on the two-dimensional quadratic residue reflection phase grating principle, using an array of square wells separated by both vertical and horizontal dividers. The depths of the phase wells shall be based on the quadratic number theory sequence based on prime 7. The diffusing panels best installed in an optimized orientation as recommended by project acoustic consultant or the manufacturer.
   3. The overall dimensions shall be 22-7/8"(H) x 22-7/8"(W) x 4"(D) and weigh no more than 22 pounds.
   4. Shall be fabricated from non-combustible glass reinforced gypsum.
   5. Paint per architect direction.
C. AU3 – Diffusive Wall: Barrel Type
   1. Basis of design: Golterman & Sabo WDL
   2. The overall dimensions shall be 2’ x 2’.
   4. Additional stiffener required to the backside of the standard barrel diffuser to reduced low frequency absorption.
   5. NRC shall not exceed 0.10.

D. AU4 – Diffusive Wall: Random shaped
   1. Basis of design: Modular Arts – Crush
   2. Mounting: As per manufacturer’s recommendation.
   3. Core: glass reinforced cast rock with a plant based foam core.
   4. Panel Size: 32” x 32”
   5. Panel Height: As indicated on drawings.
   6. Finish: Paint to match PA1

E. AU5 – Surface Mounted Matte Felt
   1. Basis of design: MDC Zintra Acoustic Panels
   2. Mounting: Adhere to substrate with adhesive.
   3. Context: 100% Polyester
   4. NRC 0.30
   5. Size: As noted on drawings.
   6. Thickness: ¼” thick maximum.
   7. Color: White or as selected by architect.

F. AF4 – Pegboard Movable Acoustic Panel:
   1. Refer to detail on architectural drawings for construction. Continuous wood cleat / picture rail shall be included as part of the custom panel.
   2. Custom design and fabricated millwork. Refer to Interior Finish Carpentry and Architectural Woodwork specification for additional information.
   3. Fabric and paint per architect direction.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install items plumb (or as indicated on the Contract Documents), straight, square, level, and in their proper elevation, plane and location.

B. Pre-assemble diffusers in shop to the greatest extent possible, so as to minimize field splicing and assembly of units at the project site. Complete the fabrication and assembly of units prior to the application of finishes, so that untreated or uncoated edges will not be exposed. Disassemble units only to the extent necessary to comply with shipping limitations. Mark units clearly for re-assembly and proper installation.

C. AU1 - Install monolithic panels on 1-½” thick furring and fill void completely with 1” thick 3 pcf fiberglass. Install vented molding at bottom of panel to allow for air movement and to prevent accumulation of moisture between panel and substrate.

D. AU2 and AU3 -Diffuser panels shall be wall mounted, fully adhered and mechanically fastened to substrate to provide air-tight, snug-routed joints at the back of each panel without voids.

E. AU4 and AU5 – install where noted on drawings, mounting per manufacturer guidelines.

END OF SECTION
SECTION 098443 - ACOUSTICAL WOOD PANELING

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. Acoustical wood ceiling paneling.

1.3 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product adhesives.
B. Shop Drawings: Show location of paneling, large-scale details, attachment devices, and other components. Include dimensioned plans and elevations.
   1. For paneling produced from pre-manufactured sets, show finished panel sizes, set numbers, and sequence numbers within sets.
C. Samples for Verification:
   1. Veneer-faced panel products for transparent finish, 8 by 10 inches, for each species and cut. Include finish as specified.

1.5 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.
B. Recycled Content: Manufacturer’s or fabricator’s certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.
C. Rapidly Renewable Materials: Manufacturer’s documentation declaring type and percentage of rapidly renewable materials contained in each product. Document the material cost of each rapidly renewable component.
D. Certified Wood: For certified wood and wood products provide documentation of certified status of forest. Documentation to contain supplier’s Chain of Custody number, identify each certified product, and manufacturer on a line item basis. Provide percentage and cost of each certified wood component. Submit vendor’s invoice for certified wood and wood products.
E. Low-Emitting Materials - Adhesives and Sealants: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.

1. Provide quantity take offs for each adhesive.

F. Low-Emitting Materials - Composite Wood and Agrifiber Products: Manufacturer’s certificate for each composite wood or agrifiber and adhesive indicating no added urea-formaldehyde resin.

G. Product Certificates: For each type of product.

H. Minutes of preinstallation conference.

1.6 WARRANTY

A. Manufacturers warranty against defects up to one year. Changes in finish or dimensions due to ultra violet light, excessive temperature or humidity conditions and/or abuse of any any shall void any warranties.

1. Warranty for one (1) year from final acceptance of completed work.

1.7 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Adhesives: Provide the quantity of each interior adhesive used.

1.8 QUALITY ASSURANCE

A. Certified Wood: Provide wood and wood products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC 1.2, “Principles and Criteria.”

B. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to the following:

1. Wood Adhesives: 30 g/L.
2. Multipurpose Construction Adhesives: 70 g/L.
3. Contact Adhesive: 80 g/L.
4. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.

C. Low-Emitting Materials - Composite Wood and Agrifiber Products: Use composite wood and agrifiber products that contain no added urea-formaldehyde resins on the interior of the building. Laminating adhesives used to fabricate such products shall also not contain added urea-formaldehyde resins.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver paneling until painting and similar operations that could damage paneling have been completed in installation areas. If paneling must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in “Field Conditions” Article.
FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

COORDINATION

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

PART 2 - PRODUCTS

2.1 ACOUSTICAL WOOD PANELING [AC4]

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

1. Architectural Components Group, Inc., Allegro ceiling panels

B. Wood Species and Cut: White oak, rift sliced.

C. Wood Finish: ACGI clear finish with satin sheen

D. Matching of Adjacent Veneer Leaves: Book match.

E. Provide a factory-attached perimeter trim, height as per drawings. The perimeter trim shall be around each ceiling cloud.

F. Panel-Matching Method: Pre-manufactured panel sets used full width within each separate area.

G. Panel Core Construction: Manufacturer's standard 3/4 inch thick core.

H. Panel Spacing: As indicated in drawing.

2.2 MATERIALS

A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.

1. Veneer-Faced Panel Products: Manufacturer's standard core, made with adhesive containing no urea formaldehyde.
2.3 INSTALLATION MATERIALS
   A. Suspension System: Allegro ceiling panels suspended from the structure utilizing ACGI supplied suspension hangers from contractor supplied UniStrut.

2.4 FABRICATION
   A. Complete fabrication and finishing before shipment to Project site. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

PART 3 - EXECUTION

3.1 PREPARATION
   A. Before installation, condition paneling to average prevailing humidity conditions in installation areas.
   B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION
   A. Install paneling level, plumb, true, and straight with no distortions. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
      1. For acoustical paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.

3.3 ADJUSTING AND CLEANING
   A. Repair damaged and defective paneling, where possible, to eliminate defects; where not possible to repair, replace paneling. Adjust for uniform appearance.
   B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 098443
SECTION 099123 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
   1. Gypsum board.

B. Related Requirements:
   1. Section 099300 “Staining and Transparent Finishing” for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
   2. Section 099600 “High-Performance Coatings” for high-performance and special-use coatings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

1.4 INFORMATIONAL SUBMITTALS

A. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current “MPI Approved Products List” for each product category specified in Part 2, with the proposed product highlighted.
   3. VOC content.

B. Low-Emitting Materials - Paints and Coatings: Include manufacturer’s printed statement of VOC content in g/l and Material Safety Data Sheet for each interior paint and coating.
   1. Provide quantity take offs for each interior finish paint, coating, and primer.
1.5 CLOSEOUT SUBMITTALS
   A. Low-Emitting Materials - Paints and Coatings: Provide the quantity of each interior finish coating, paint, and primer used.

1.6 MAINTENANCE MATERIAL SUBMITTALS
   A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
      1. Paint: 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE
      1. Flats and Primers: 50 g/l.
      2. Non-Flat: 150 g/l.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:
      1. Product name or title of material.
      2. Product description (generic classification or binder type).
      3. Manufacturer's stock number and date of manufacture.
      4. Contents by volume, for pigment and vehicle constituents.
      5. Thinning instructions.
      6. Application instructions.
      7. Color name and number.
      8. VOC content.
   B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
      1. Maintain containers in clean condition, free of foreign materials and residue.
      2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS
   A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
   B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers’ Names: Shortened versions (shown in parentheses) of the following manufacturers’ names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).

B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer’s full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer’s written instructions applicable to substrates indicated and as specified.

B. Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Provide barrier coats over incompatible primers or remove and reprime substrate with compatible primers as required to produce paint systems indicated.
   2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

D. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

E. Previously Painted Surfaces: Thoroughly clean previously painted surfaces indicated to be repainted or damaged during construction of all grease, dirt or other foreign matter. Remove blistering, cracking, flaking and peeling or other deteriorated coatings. Roughen slick surfaces. Repair damaged areas such as, but not limited to, nail holes, cracks, chips, and spalls with suitable material to match adjacent undamaged areas. Feather edges and sand smooth all edges of chipped paint.
   1. Rusty metal surfaces shall be cleaned as per SSPC requirements. Solvent, mechanical, or chemical cleaning methods shall be used to provide surfaces suitable for painting. Chalk shall be removed so that when tested in accordance with ASTM D 659, the chalk resistance rating is not less than 8.
   2. New, proposed coatings shall be compatible with existing coatings. If existing surfaces are glossy, the gloss shall be reduced.

F. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
   1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
   3. Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

A. Apply paints according to manufacturer’s written instructions and to recommendations in “MPI Manual.”
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
   5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   6. Do not paint wiring, including low and line voltage.
   7. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
   1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
   2. Omit primer over metal surfaces that have been shop primed and touchup painted.
   3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
   4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

F. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
   1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
   2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
   3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

G. The term "exposed surfaces" includes:
   1. Areas visible that call for paint including wood trims, stools, blocking or trims, and partitions and items built from gypsum drywall including coves, returns, and edges.
   2. Areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place.
   3. Exposed mechanical (HVAC and plumbing) and electrical elements including, but not limited to, conduit, cables, work boxes, ATU equipment, air distribution hard and flexible ducts, grilles, diffusers, piping, and other items in areas called to be left exposed (including those that may be semi-exposed for directly underneath, but seen at adjacent angles of view.)

H. Minimum Coating Thickness: Apply paint materials at a spreading rate to achieve manufacturer's recommended dry film thickness.

I. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

J. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

K. Spray apply paint on wood substrates.

L. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer’s written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer’s written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINT SCHEDULE

A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
   a. Primer: Factory-formulated latex-based primer for interior application.
      1) Benjamin Moore; Zero VOC Ultra Spec 500 Interior Latex Primer N534.
      2) Sherwin-Williams; ProMar 200 Zero VOC Primer B28 Series.
      1) Benjamin Moore; Zero VOC Ultra Spec 500 Interior Eggshell N538.
      2) Sherwin-Williams; ProMar 200 Zero VOC Eg-Shel, B20-2600
SECTION 099600 - HIGH-PERFORMANCE 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 surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates:
    a. Galvanized metal.

2. Interior Substrates:
    a. Steel.
    b. Galvanized metal.
    c. Aluminum (limited locations as indicated in drawings - interior millwork counter support brackets).
    d. Gypsum board (limited locations as indicated in interior drawings)

B. Related Requirements:
1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
2. Section 099123 "Interior Painting" for special-use coatings and general field painting.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
   3. VOC content.
1.4 INFORMATIONAL SUBMITTALS

A. Low-Emitting Materials - Paints and Coatings: Include manufacturer's printed statement of VOC content in g/l and Material Safety Data Sheet for each interior paint and coating.

1. Provide quantity take offs for each interior finish paint, coating, and primer.

1.5 CLOSEOUT SUBMITTALS

A. Low-Emitting Materials - Paints and Coatings: Provide the quantity of each interior finish coating, paint, and primer used.

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. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

2. Coatings: 1 gal. of each material and color applied.

1.7 QUALITY ASSURANCE


1. Flats and Primers: 50 g/l.
2. Non-Flat: 150 g/l.


1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Exterior High Performance Coatings:

1. Basis-of-Design Product: The design for exterior high-performance coatings is based on Tnemec Company, Inc. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:
   a. Ameron.
   b. Carboline.

B. Interior High Performance Coatings:

1. Products: Subject to compliance with requirements, provide one of the products indicated in the High-Performance Coating Schedules at end of Part 3 of this Section.
   2. Manufacturers' Names: The following manufacturers are referred to in the High-Performance Coating Schedules by shortened versions of their names shown in parenthesis:
      b. Sherwin Williams; Industrial and Marine Coatings (S-W).

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
   3. Provide products of same manufacturer for each coat in a coating system.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR HIGH-PERFORMANCE COATINGS

A. Epoxy, Polyamidoamine:

1. Abrasion: ASTM D 4060, (CS-17 Wheel, 1,000 grams load); no more than 140 mg loss after 1,000 cycles.
   2. Adhesion:
      a. ASTM D 4541 Type II Fixed Alignment Adhesion Tester; no less than 1,583 psi pull, average of three tests.
      b. ASTM D 4541 Type V Self-Aligning Adhesion Tester; no less than 1,943 psi pull, average of three tests.
   3. Exterior Exposure: ASTM D 1014; Kansas City 45 degree facing south; no blistering, cracking, checking, rusting or delamination of film. No rust creepage at scribe after 5 years exposure.
   4. Humidity: ASTM D 4585; No blistering, cracking, checking, rusting or delamination of film after 10,000 hours exposure.
   5. Immersion: ASTM D 870; no blistering, cracking, checking, rusting or delamination of film after two years continuous water immersion.
6. Moisture Vapor Transmission: ASTM D 1653; no more than 9.9 g/m sq. 24 hours water vapor transmission and no more than 0.31 grains/ft sq./hour in Hg. Water vapor permeability.
7. Prohesion: ASTM B 117; no blistering, cracking or delamination of film. No more than 1 percent rusting on plane. No more than 1/16 inch rust creepage at scribe after 6,700 hours exposure.

B. Acrylic Polyurethane, Aliphatic, 2 part:
1. Abrasion: ASTM D 4060 (CS-17 Wheel, 1,000 g load); No more than 139 mg los after 1,000 cycles, average of three tests.
2. Adhesion:
   a. ASTM D 3359, (Method B, 5mm Crosshatch); no less than a rating of 5.
   b. ASTM D 4541 (Method B, Type II); not less than 1.112 psi pull, average of three tests.
   c. ASTM D 4541 (Method E, Type V); not less than 1.423 psi pull, average of three tests.
3. Exterior Exposure: ASTM D 4141 Method C; no blistering, cracking or chalking. No less than 84 percent gloss retention and 0.44 DED Hunter Lab Scale color change after 500 MJ exposure.
4. Flexibility:
   a. ASTM D 522 (Method A, Conical Mandrel); no less than 14.4 percent elongation, average of three tests.
   b. ASTM D 522 (Method B, Cylindrical Mandrel); no cracking or delamination of film when tested with 1/4-inch mandrel; no less than 19.2 percent elongation, average of three tests.
5. Hardness: ASTM D 3363, no gouging of scratching with a HB or less pencil.
6. Humidity: ASTM D 4585; no blistering, cracking, rusting or delamination of film after 4,000 hours exposure.
7. Impact: ASTM D 2794; no cracking or delamination of film after 35 inch-pounds direct impact, average of three tests.
8. Prohesion: ASTM G 85 (Annex A5); no blistering, cracking, rusting or delamination of film. No more than 1/16 inch rust creepage at scribe after 10,000 hours exposure.
9. QUV Exposure: ASTM D 4587 (UVA0340 bulbs, Cycle 4: 8 hours UV/4hours condensation); no blistering cracking, chalking or delamination of film. No less than 58 percent gloss retention (24 units gloss change) and no more than 1.5 DED FMCII (MacAdam units) color change after 2,000 hours exposure.
10. Salt Spray (Fog): ASTM B 117, no blistering, cracking, rusting of delamination of film. No more than 1/16 inch rust creepage at scribe after 9000 hours exposure.

2.4 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Gypsum Board: 12 percent.

B. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
   1. Blast clean according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

E. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces with 1 mil profile that promotes adhesion of subsequently applied coatings.
3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Galvanized-Metal Substrates:

1. Semigloss, Alkyd-Based, Light-Industrial Coating System:
   1) Tnemec: Series N69 Hi-Build Epoxoline II

b. Topcoat: Acrylic polyurethane, aliphatic.
   1) Tnemec: Series 1075U Endura-Shield

3.7 INTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. Semigloss, Water-Based, Light-Industrial Coating System:
   
a. Prime Coat <(location)>: Inorganic zinc primer.
      1) Moore: NOT AVAILABLE
      2) S-W: Zinc Clad II LV Inorganic Zinc Rich Primer
   
b. Prime Coat <(location)>: Rust-inhibitive primer, (water based).
      1) Moore: Acrylic Metal Primer M04
      2) S-W: DTM Acrylic Primer/Finish
   
      1) Moore: DTM Acrylic Semi-Gloss M29
      2) S-W: DTM Semi gloss coating
   
d. Topcoat: Water-based, light-industrial coating,
      1) Moore: DTM Acrylic Semi-Gloss M29
      2) S-W: DTM Semi gloss coating

END OF SECTION 099600
SECTION 101100 - 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. Laminated Glass Markerboards.

B. Related Sections:

1. Section 06 10 53 "Miscellaneous Rough Carpentry" for canted battered board for mounting cleat attachment.

1.3 DEFINITIONS

A. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes chalkboards, markerboards, and tackboards.

B. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of chalkboards, markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of special-purpose graphics for visual display surfaces.

C. Samples for Verification: For each type of visual display surface indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches.
2. Accessories: Sample of each type of accessory.

D. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.
B. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

C. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

D. Low-Emitting Materials - Adhesives: Include manufacturer's printed statement of VOC content in g/l for each interior adhesive.
   1. Provide quantity take offs for each adhesive.

E. Minutes of preinstallation conference.

F. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Minimum three years experience in the installation of glass.

B. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:
   1. Gypsum Board and Panel Adhesives: 50 g/L.

C. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.
   1. Build two mockups of typical display surface mounted on wall area, 18” x 18” with graphic stave lines as shown on Drawings. One with 1.5 point lines and one with 2 point lines.

E. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces completely assembled in one piece without joints.

B. Store visual display surfaces vertically with packing materials between each unit.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces 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 surfaces by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty for Laminated Glass Units: Manufacturer's standard form in which manufacturer agrees to repair or replace laminated glass 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: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MARKERBOARD ASSEMBLIES

A. Laminated Glass:

1. Matte-Finish Top Lite: Low reflective; chalk wipes clean with dry cloth or standard eraser.
   a. Products: Subject to compliance with requirements, provide one of the following:
      2) Clarus, Glassboard Flo. Contact: Maggie Goss, maggie@mercurycontract.com

B. Associated Components:

1. Top Lite:
   a. Type: Annealed
   b. Thickness: 3.0 mm
   c. Class: Low iron

2. Bottom Lite:
   a. Type: Annealed
   b. Thickness: 3.0 mm
   c. Class: Low iron

3. Interlayer:
   a. Thickness: 2 mm

2.2 ACCESSORIES

A. Magnets:

1. Profile: Cube
2. Size: 3/8" x 3/8" x 3/8"
3. Strength: N42
4. Max. Sheets of Paper Held: 7 (seven)

B. Marker Trays: Length of tray to match length of panel.

2.3 MOUNTING SYSTEM FOR VISUAL DISPLAY BOARDS

A. Mounting cleat: Two pieces of extruded aluminum.
   1. The extrusion on the back of the glass is attached using structural glazing tape.
   2. Provide sloped battered blocking attached to the wall, refer to drawing detail.
   3. The second extrusion is fastened to the battered blocking.

2.4 GENERAL FINISH REQUIREMENTS

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.

2.5 VISUAL DISPLAY SURFACE SCHEDULE

A. Laminated Glass Visual Display Board [WS1]:
   1. Display board without printed graphic.
      a. Configuration: Single-Sided Magnetic
      b. Glass Color: Ultra White
      c. Finish: Pearlex
      d. Processing: Polished edges
      e. Overall Nominal Thickness: 8.0 mm
   2. Location and Size:

B. Laminated Glass Visual Display Board [WS2]:
   1. Display board with printed stave graphic. Refer to elevation ___.
      a. Configuration: Single-Sided Magnetic
      b. Glass Color: Ultra White
      c. Stave Color: Black
      d. Finish: Pearlex
      e. Processing: Polished edges
      f. Overall Nominal Thickness: 8.0 mm
   2. Location and Size: Refer to drawings.
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 walls and partitions for proper preparation and backing for visual display surfaces.

C. 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 the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

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 surfaces and wall surfaces.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings and Schedule. Keep perimeter lines straight, level, and plumb. Provide backing materials, adhesives, brackets, anchors, and accessories necessary for complete installation.

B. Protect glass and equipment from damage.

C. Install in accordance with Manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

A. Clean visual display surfaces according to GANA Glazing Manual.

B. Cover and protect visual display surfaces after installation and cleaning.

END OF SECTION 101100
SECTION 102113 - TOILET COMPARTMENTS

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-polymer toilet compartments configured as toilet enclosures and urinal screens.

B. Related Sections:

1. Section 055000 "Metal Fabrications" for supports that attach to overhead structural system.
2. Section 102800 "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.

C. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:

1. Each type of material, color, and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
2. Each type of hardware and accessory.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

1. Polyethylene (HDPE) panel material.
C. Low-Emitting Materials - Composite Wood and Agrifiber Products: Manufacturer's certificate for each composite wood or agrifiber and adhesive indicating no added urea-formaldehyde resin.

D. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Low-Emitting Materials - Composite Wood and Agrifiber Products: Use composite wood and agrifiber products that contain no added urea-formaldehyde resins on interior of building. Laminating adhesives used to fabricate such products shall also not contain added urea-formaldehyde resins.


C. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84, or another standard acceptable to authorities having jurisdiction, 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.

D. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221.

2.2 SOLID-POLYMER UNITS {SP-1}

A. Basis-of-Design Product: Subject to compliance with requirements, provide Scranton Products - HinyHiders or comparable product by one of the following:

1. Bradley Corporation; Mills Partitions.
2. Metpar Corp.

B. Toilet-Enclosure Style: Overhead braced Floor anchored.
C. Urinal-Screen Style: Wall hung.

D. Door, Panel, Screen, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch 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 strip fastened to exposed bottom edges of solid-polymer components to prevent burning.
3. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.

E. Pilaster Shoes: Manufacturer's standard design; polymer.

F. Brackets (Fittings):
   1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.
   4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
   5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
   6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.
   7. Pilaster shoe: Stainless steel

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, 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.

2.4 FABRICATION

A. 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.

B. 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.

C. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.
PART 3 - EXECUTION

3.1 INSTALLATION

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.
   b. Panels and Walls: 1 inch.

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 into structural floor unless otherwise indicated in manufacturer’s written instructions. Secure continuous head rail to each pilaster with no fewer than two 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. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer’s written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

D. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 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 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113
SECTION 102215.19 - GLASS PARTITION SYSTEMS

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 sound partitions.

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 glass partitions.

1. Include plans, elevations, and sections; attachment details at floors, columns, permanent partitions, and ceilings; and method of erection and disassembly.

2. Include diagrams for power-, signal-, and control-wiring raceways; and details of access to raceways.

C. Samples for Verification: For each type of the following products:

1. Linear Trim: 12-inch long Samples.

2. Door Finish: Manufacturer's standard-size unit, but not less than 3 inches square.

3. Glazing: Manufacturer's standard-size unit, but not less than 3 inchessquare.

4. Hardware and Accessories: cut sheets

1.5 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

C. Product Certificates: For each type of glass partition and door.
D. Product Test Reports: For each type of glass partition assembly, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For glass partitions to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Low-Emitting Materials - Adhesives: Use interior adhesives that comply with VOC limits of South Coast Air Quality Management District Rule 1168 effective date of July 1, 2005 and rule amendment date of January 7, 2005. VOC limits include but are not limited to following:

1. Multipurpose Construction Adhesives: 70 g/L.

1.8 FIELD CONDITIONS

A. Finished Spaces: Do not deliver or install glass partitions until finishes in spaces to receive them are complete, including suspended ceilings, floors, carpeting, and painting.

B. Field Measurements: Indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Acoustical Performance: Where acoustical rating is indicated, provide glass partition assembly tested by a qualified testing agency for sound transmission loss performance according to ASTM E 90, calculated according to ASTM E 413, and rated for not less than the STC value indicated.

2.2 GLASS PARTITIONS SYSTEM [GL1]

A. General: Site-assembled, progressive, glass-partition assembly and components that are the standard products of manufacturer.

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. Maars US Inc.; Living Walls (Basis-of-Design)

B. Manufacturer's Product:

   1. Horizon track with acoustic glass
   2. Metaline frameless glass door
   3. Metaline solid perforated panel

C. Acoustical Rating:

   1. Walls: STC 36
   2. Doors: STC 35
D. Glazing Frames: Manufacturer's standard steel frames for glazing thickness indicated.
   1. Frame description: butt-joined glass in Horizon track, track is 1-3/8” wide
   2. Frame Finish: polyester epoxy powder coating

E. Panel Frame:
   1. Metaline track with perforated metal panels, 3-1/4 inch wide
   2. Finish: polyester epoxy powder coating

F. Door is frameless acoustical laminated glass in with drop seal and locking mortise set with 3-1/4” wide Metaline track casing.

G. Glazing: Manufacturer's standard laminated clear float glass.
   1. 1/2 inch thick acoustical

H. Seals: Manufacturer's standard.

2.3 GLASS PARTITION SYSTEM [GL2]

A. General: Site-assembled, progressive, glass-partition assembly and components that are the standard products of manufacturer.
   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. Maars US Inc.; Living Walls (Basis-of-Design)

B. Manufacturer's Product:
   1. String 2 track with acoustic double pane glass
   2. XL double pane glass door

C. Acoustical Rating:
   1. Walls: STC 45
   2. Doors: STC 41

D. Glazing Frames: Manufacturer's standard steel frames for glazing thickness indicated.
   1. Frame description: double pane glass in wide track, 3-15/16 inch wide
   2. Frame Finish: polyester epoxy powdercoating

E. Door is solid double pane clear acoustical laminated glass, with drop seals and integrated closers.
   1. 3-15/16” wide door frame: 1/4-inch tempered / air / 5/16-inch tempered glass flush mounted to frame

F. Glazing: Manufacturer’s standard laminated clear float glass.
   1. 3-15/16” wide frame: 1/4-inch tempered / air / 5/16-inch laminated glass flush mounted to frame

G. Seals: Manufacturer's standard.
2.4 FABRICATION

A. General: Fabricate glass walls for installation with concealed fastening devices and pressure-fit members that will not damage ceiling or floor coverings. Fabricate systems for installation with continuous seals at floor, ceiling, and other locations where partitions abut fixed construction.

B. Panels for Partitions: Face panels fabricated and finished in modular widths indicated.

C. Coordinate power and data with partition track and framing.

2.5 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 INSTALLATION

A. General: Install glass partitions after other finishing operations have been completed.

1. Install partitions rigid, level, plumb, and aligned. Install seals at connections with floors, ceilings, fixed walls, and abutting surfaces to prevent light and sound transmission.

2. Broken, cracked, chipped, deformed, or unmatched panels and components are not acceptable.

3. Except for filler panels scribed to fixed walls or columns, do not modify manufacturer's standard components.

B. Suspended-Ceiling System: Make alterations to suspended-ceiling system required by partition installation or to gain access to electrical or communication systems without affecting the structural integrity of suspended-ceiling system. Make alterations so they are not noticeable after panel installation.

3.2 ERECTION TOLERANCES

A. Install each glass partition so surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent partitions.

3.3 ADJUSTING

A. Inspect installation, correct misalignments, and tighten loose connections.

B. Adjust doors to operate smoothly and easily, without binding or warping.

C. Check and readjust operating hardware. Verify that latches and locks engage accurately and securely without forcing or binding; lubricate as recommended by manufacturer.

D. Clean soiled surfaces to remove dirt, fingerprints, adhesives, and other foreign materials according to manufacturer's written instructions.

E. Remove and replace defaced or damaged components.
F. Remove and replace components that are wet, moisture damaged, or mold damaged.

END OF SECTION 102219
SECTION 102800 - 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. Warm-air dryers.

B. Owner-Furnished Material: Freestanding Waste Receptacle

C. Related Sections:
   1. Section 055000 "Metal Fabrications" for backing material coordination.
   2. Section 088300 "Mirrors" for frameless mirrors.
   3. Section 093000 "Tiling" for ceramic tile
   4. Section 102113 "Toilet Compartments"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:
   1. Construction details and dimensions.
   2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
   3. Material and finish descriptions.
   4. Features that will be included for Project.
   5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
   1. Identify locations using room designations indicated.
   2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.
C. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

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.

1.7 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.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. 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.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. American Specialties, Inc.
2. Bobrick Washroom Equipment, Inc.

B. Toilet Tissue (Roll) Dispenser:

2. Description: Double-roll dispenser.
4. Capacity: Designed for 5-inch diameter tissue rolls.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

C. Liquid-Soap Dispenser:

2. Description: Designed for dispensing soap in liquid or lotion form.
4. Capacity: 1-Liter
5. Materials: Plastic
6. Lockset: Tumbler type

D. Waste Receptacle: Freestanding and Owner Furnished / Owner Installed.

E. Grab Bar <Insert drawing designation>:

1. Basis-of-Design Product: Bobrick, B-series: B5806x42; B55806x36; B5806x18.
3. Material: Stainless steel, 0.05 inch thick.
   a. Finish: Smooth, No. 4 finish satin.
5. Configuration and Length: As indicated on Drawings.

2.3 WARM-AIR DRYERS

A. Warm-Air Dryer:

1. Basis-of-Design Product: World Dryer Corporation, VERDidri
   a. Operation Time: adjustable two speed controls
5. Electrical Requirements: 115 V, 20 A, 2300 W.

2.4 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 twelve (12) 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, 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 recommendations.

END OF SECTION 102800
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 portable fire extinguishers.
2. Fire Cabinet for fire department valve.

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. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 INFORMATIONAL SUBMITTALS

A. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

B. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of the project site. Document the material cost of each Product.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.6 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.

1.7 SEQUENCING

A. Apply vinyl lettering on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 SECURITY FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Manufacturers: Subject to compliance with requirements, provide product by one of the following:

   a. Fire End & Croker Corporation.
   b. Guardian Fire Equipment, Inc.
   c. JL Industries, Inc.; a division of the Activar Construction Products Group.
   d. Larsens Manufacturing Company.
   e. Nystrom, Inc.
   f. Potter Roemer LLC.

B. Cabinet Construction: Nonrated.

C. Cabinet Material: 0.078-inch-thick stainless-steel sheet.

1. Shelf: Same metal and finish as cabinet.

D. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Cabinet Trim Material: Stainless-steel sheet.

F. Door Material: 0.109-inch-thick stainless-steel sheet.

G. Door Style: Solid opaque 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, and as follows:

1. Recessed door pull.
2. Continuous Hinge: Same material and finish as trim, permitting door to open 180 degrees.
3. Mechanical Deadlock: Lockbolt retracted and extended by five-tumbler cylinder; keyed one side.


I. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.

   a. Identify fire extinguisher in security fire-protection cabinet with the words "FIRE EXTINGUISHER."
1) Location: Applied to cabinet door.
2) Application Process: Pressure-sensitive vinyl letters.
3) Lettering Color: Black.
4) Orientation: Vertical.

2. Keys: Three per door lock.

J. Materials:

1. Stainless Steel: ASTM A 666, Type 304.
   a. Finish: No. 4 directional satin finish.

2.2 VALVE CABINETS

A. Cabinet Type: For use with 2-1/2-inch fire department valve.

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. Potter Roemer LLC. (Basis-of-Design)
      1) Model 1810 Recessed

2. Cabinet Construction: Non-rated

B. Door and Cabinet Material: -SS, Stainless Steel, 304 w/ #4 Finish

C. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

D. Door Style: A - Full glass, w/ Tempered Safety Glass.

E. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated, and as follows:

1. Continuous Steel Hinge: Same material and finish as trim, permitting door to open 180 degrees.
2. Handle: Manufacturers lever handle / cam latch

F. Accessories:

1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
   a. Identify valve in fire-protection cabinet with the words "FIRE DEPARTMENT VALVE"
      1) Location: Applied to cabinet door glass.
      2) Application Process: Manufacturer's Standard
      3) Lettering Color: Red

2. Orientation: three lines centered
2.3 MOUNTING BRACKETS

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 black baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Amerex Corporation.
   b. Ansul Incorporated.
   c. Badger Fire Protection.
   d. Buckeye Fire Equipment Company.
   e. Fire End & Croker Corporation.
   f. Guardian Fire Equipment, Inc.
   g. JL Industries, Inc.; a division of the Activar Construction Products Group.
   h. Larsens Manufacturing Company.
   i. Nystrom Building Products.
   j. Potter Roemer LLC.
   k. Strike First Corporation of America.

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.

2.4 Orientation: Vertical.

2.5 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 of one-piece construction with edges flanged.
2. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.6 GENERAL FINISH REQUIREMENTS


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 roughing-in for cabinets to verify actual locations of piping connections before cabinet installation.

B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for recessed 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 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.

C. Identification: Apply vinyl lettering 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 104413
SECTION 111300 - LOADING DOCK 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. Dock levelers.

B. Related Sections:

1. 034500 "Precast Concrete Finishing" for coordination with precast dock structure.

1.3 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for loading dock equipment. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For loading dock equipment. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the state of Missouri responsible for their preparation and who certifies that they comply with requirements and recognized engineering principles and practice.

B. Qualification Data: For qualified Installer and professional engineer.
C. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document material cost of each Product.

D. Regional Materials: Manufacturer's certificate demonstrating that each material or product was extracted, harvested, or recovered, as well as manufactured within 500 miles of project site. Document material cost of each Product.

E. Welding certificates.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency; indicate compliance of dock levelers with requirements in MH 30.1 for determining rated capacity, which is based on comprehensive testing within last two years of current products.

1. Submittal Form: According to MH 30.1, Appendix A.

G. Minutes of preinstallation conference.

H. Sample Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For loading dock equipment to include in operation and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Missouri and who is experienced in providing engineering services of the kind indicated.

C. Source Limitations: Obtain loading dock equipment from single source from single manufacturer.

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

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

E. 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.

F. Preinstallation Conference: Conduct conference at Project site.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Review sequence of operation for each type of loading dock equipment.
3. Review coordination of interlocked equipment specified in this Section and elsewhere.
4. Review required testing, inspecting, and certifying procedures.
1.8 DELIVERY, STORAGE, AND HANDLING

A. Store and handle dock in a manner to avoid significant or permanent damage to fabric or frame.
   1. Comply with manufacturer's written instructions for minimum and maximum temperature requirements for storage.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with loading dock equipment, including recessed pit dimensions slopes of driveways and heights of loading docks, by field measurements before fabrication.

1.10 WARRANTY

A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock-leveler components that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Structural failures including cracked or broken structural support members, load-bearing welds, and front and rear hinges.
      b. Faulty operation of operators, control system, or hardware.
      c. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch between deck supports.
      d. Hydraulic system failures including failure of hydraulic seals and cylinders.
   2. Warranty Period for Structural Assembly: Ten (10) years from date of Substantial Completion.
   3. Warranty Period for Hydraulic System: Five (5) years from date of Substantial Completion.
   4. Warranty shall be for unlimited usage of leveler for the specified rated capacity over the term of the warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55.

C. Steel Tubing: ASTM A 500, cold formed.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 EDGE-OF-DOCK LEVELERS

A. General: Surface-mounted, hinged-lip-type, edge-of-dock levelers designed for permanent installation on face of loading dock platform; of type, function, operation, capacity, size, and construction indicated; and complete with controls, safety devices, and accessories required.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Pentalift EDH Series or comparable product by one of the following:

   a. Beacon Industries, Inc.
   b. Blue Giant Equipment Corporation.
   c. Chalfant Dock Equipment.
   d. DLM, Inc.
   e. Ellis Industries, Inc.
   f. Flexon, Inc.
   g. McGuire, W. B. Co., Inc.; Division of Overhead Door Corporation.
   h. Nordock Inc.
   i. NOVA Technology International, L.L.C.
   j. Pentalift Equipment Corporation.
   k. Pioneer Loading Dock Equipment.
   l. Poweramp; Division of Systems, Inc.
   m. Rol-Lift Corporation.
   n. Rotary Products Inc.
   o. Vestil Manufacturing Company.

B. Standard: Comply with MH 30.1, except for structural testing to establish rated capacity.

C. Rated Capacity: Capable of supporting a minimum total gross load of 20,000 lbs. without permanent deflection or distortion.

D. Platform Ramp Width: 84 inches.

E. Hinged Lip: Nonskid steel tread plate.

   1. Hinge: Full width, piano-type hinge with heavy-wall hinge tube and greased fittings, with gussets on lip and ramp for support.

F. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform.

   1. Vertical Travel: Operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact with the following minimum working range:

      a. Above Adjoining Platform: 5 inches.

   2. Lip Operation: Manufacturer’s standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler’s working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.

      a. Length of Lip Extension: 15 inches.

G. Hydraulic Operating System: Electric control from a remote-control station; fully hydraulic operation. Electric-powered hydraulic raising and hydraulic lowering of ramp. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp’s free fall to not more than 3 inches.

   1. Remote-Control Station: Weatherproof single-button station of the constant-pressure type, enclosed in NEMA ICS 6 box. Ramp and lip raise to vertical position and extend to truck bed by depressing and holding button.
H. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- and formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.

2. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.

I. Integral Molded-Rubber Dock Bumpers: Fabricated from 4-inch- or 6-inch- thick, heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Type A Shore durometer hardness of 80, plus or minus 5, when tested according to ASTM D 2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.

J. Dock-Leveler Finish: Painted in manufacturer's standard color.

2.3 GENERAL FINISH REQUIREMENTS

A. Finish loading dock equipment after assembly and testing.

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 loading dock equipment.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.

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

3.2 PREPARATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Place self-forming pan system for edge-of-dock levelers in proper relation to loading platform before pouring concrete.

C. Clean recessed pits of debris.

3.3 INSTALLATION

A. General: Install loading dock equipment, including motors pumps control stations wiring and accessories as required for a complete installation.
1. Rough-in electrical connections.

B. Edge-of-Dock Levelers: Attach dock levelers to loading dock platform in a manner that complies with requirements indicated for arrangement and position relative to top of platform.

1. Weld anchor holes in contact with continuous embedded loading dock edge channel. Weld or bolt bumper blocks to face of loading dock.

3.4 ADJUSTING

A. Adjust loading dock equipment to function smoothly and safely, and lubricate as recommended by manufacturer.

B. Test dock levelers for vertical travel within operating range indicated.

C. After completing installation of exposed, factory-finished loading dock equipment, inspect exposed finishes and repair damaged finishes.

3.5 DEMONSTRATION

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

END OF SECTION 111300
SECTION 112400 – MAINTENANCE 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. Fall Arrest System.

B. Related Sections:
   1. Section 075419 "Polyvinyl - Chloride (PVC) Roofing for coordination with roofing system materials and Installations.

1.3 PERFORMANCE REQUIREMENTS

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

B. General Performance: Maintenance equipment 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.

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide a complete, integrated set of mutually dependent components and assemblies that form a system capable of withstanding loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include framing and accessories complying with requirements indicated, including those in this Article.

B. Fall Arrest System: Design fall arrest system to comply with the following:
   1. The fall arrest system shall be designed to fully protect the user at all time while in the area of potential fall hazard. The system must be designed to allow the user to be tied-off prior to entering the potential fall hazard.
   2. System shall be designed for three simultaneous users and shall maintain a safety factor of at least two against failure of the system or structure to which the system is attached.

C. Where referenced standards, regulatory requirements, and/or specified design requirements conflict, comply with the most stringent requirement regardless of whether it is required by law or not.

D. Obtain necessary approvals from authorities having jurisdiction.
1.5  ACTION SUBMITTALS

A.  Product Data:  For each component of fall arrest system.  Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B.  Shop Drawings:  For maintenance equipment.  Include plans, elevations, keyed details, and attachments to other work.  Indicate dimensions, loadings, and special conditions.  Distinguish between plant- and field-assembled work.

1.6  INFORMATIONAL SUBMITTALS

A.  For fall arrest system indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer licensed in the State of Missouri and responsible for their preparation and who certifies that they comply with requirements and recognized engineering principles and practice

1.  Shop drawings and design calculations must be submitted to the authority having jurisdiction upon receipt of returned information from the Architect.

B.  Coordination Drawings:  Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items.  Show the following:

1.  Size and location of maintenance equipment specified in this Section.
2.  Method of attaching maintenance equipment to roof or building structure.
3.  Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4.  Required clearances.

C.  Qualification Data:  For qualified Manufacturer Installer and professional engineer.

D.  Product Certificates:  Signed by manufacturer, verifying that products furnished comply with requirements.

1.  Letter of Design Certification:  Signed and sealed by a qualified professional engineer.  Include the following:

a.  Name and location of Project.
b.  Name of manufacturer.
c.  Name of Contractor.
e.  Design loads:  Include dead load, collateral loads, deflection, wind loads/speeds and exposure, seismic zone or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.
f.  Load combinations:  Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.

E.  Field quality-control reports verifying compliance with performance requirements.

F.  Minutes of preinstallation conference.

1.7  CLOSEOUT SUBMITTALS

A.  Operation and Maintenance Data:  For maintenance equipment to include in operation and maintenance manuals.
1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in the design and manufacturing of systems similar to those indicated for this Project.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the state of Missouri where Project is located and who is experienced in providing engineering services of the kind indicated.

1. Engineering services are defined as those performed for installations of maintenance equipment systems that are similar to those indicated for this Project in material, design, and extent.

C. Installer's Qualifications: An experienced installer who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

D. Source Limitations: Obtain fall arrest system through one source from a single manufacturer.


F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

PART 2 - PRODUCTS

A. Basis of design: Subject to requirements provide products by Probel or comparable system by the following:

1. Flexible Lifeline Systems.

2.2 METAL MATERIALS

A. Steel Shapes: ASTM A 36/A 36M, cadmium coated unless otherwise indicated.

2.3 DESIGN PERFORMANCE REQUIREMENTS


1. Fall Arrest Safety and Tie-Back Anchors: Galvanized steel; 1000 lbs working load in any direction.

   a. Fall arresting force safety factor of 2 to 1 without fracture of permanent deformation: 1800 lbs (8.0 kN) minimum.

   b. Fall arrest force against fracture or detachment: 5,000 lbs (22.4 kN) minimum.

2. Material Control: All system components shall contain serial numbers, permanently stamped or engraved, identifying the specific job and system they are used for. These serial numbers shall be recorded in the system manual and forwarded to the owner upon completion of the project.

   a. Data plate: Ensure non-corrosive data plate stating Maximum Service Capacity of cable, Manufacturer's Name, Serial No., Manufacturing Date, rated load and other pertinent information is prominently displayed at cable system entry points.
2.4 FABRICATION

A. Coordinate anchorage system with supporting structural system.

2.5 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 maintenance equipment.

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

3.2 PREPARATION

A. Ensure structure or substrate is adequate to support complete maintenance equipment.

B. Ensure structural steel to receive safety anchors has adequate bearing surface as indicated on shop drawings and has 100% welds between anchors and structural steel.

3.3 INSTALLATION

A. General: Install maintenance equipment according to manufacturer’s written instructions.

1. Install maintenance equipment level, plumb, true to line and elevation, and without jogs in alignment or tool marks.

2. Anchor maintenance equipment 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 maintenance equipment and fit them to substrates.

4. Accurately fit and align, securely fasten and install free from distortion or defects. Install maintenance equipment to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Install fall arrest system systems in accordance with manufacturer’s written instructions.

1. Install anchorage and fasteners for horizontal fall protection system in accordance with manufacturer’s recommendations to obtain the allowable working loads published in the product literature and in accordance with this specification.
C. 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 stainless-steel maintenance equipment with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.

D. Do not load or stress horizontal fall protection system until all materials and fasteners are properly installed and ready for service.

E. Deform threads of tail end of anchor studs after nuts have been tightened to prevent accidental removal and vandalism.

3.4 FIELD QUALITY CONTROL

A. Formal final inspection of the completed Work shall be made with manufacturer's representative and Architect present.

1. Submit written report summarizing results of manufacturer's inspection.

B. Proof-test fall arrest system in accordance with the manufacturer’s instructions. Proof-test load on components shall be a minimum of 3,600 pounds. System and support structure shall withstand proof-load without damage or permanent deformation.

C. Load test fall arrest system anchor installations in the presence of the Architect. If results are unsatisfactory to Architect or manufacturer, load test additional anchors as directed. Remediate or replace tested anchor as directed by manufacturer and Architect.

3.5 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Clean exposed surfaces according to manufacturer's written instructions.

C. Replace maintenance equipment that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel in use of fall arrest system. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 112400
SECTION 120000 - FURNITURE FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes
   a. Podium (Additive Alternate No. 4)
   b. Instrument Storage Lockers (Additive Alternate No. 4)
   c. Resource Library Shelving (Additive Alternate No. 4)

1.3 ACTION SUBMITTALS

A. Product Data for Podium, Instrument Storage Lockers and Resource Library Shelving

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

1.4 CLOSEOUT SUBMITTAL

A. Maintenance Data: For products to include in maintenance manuals.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install units until building is enclosed, wet work is complete and dry, and temporary HVAC system is operating and maintaining temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS (ADDITIVE ALTERNATE NO. 4)

A. Podium

   a. Model MLCS-32
   b. Classic Style Lectern with a width of 32”, a flat work surface, medium cable reservoir, cutout for an AMX MSD-701 touch panel, heavy duty drop leaf shelf, roll-out keyboard shelf, locking rear access panel, standard locking doors, 14RU fixed rack rail, passive ventilation, and locking swivel carpet casters.

B. Resource Library System

a. Music Library System
b. 7-shelf unit, 700 lbs. total unit capacity, 190 titles at 1-1/4 inch spacing per title, total capacity 241-1/2 inches

C. Instrument Storage Lockers

   a. UltraStor Storage Cabinets
   b. Cabinet #4 with wood compartment doors.
      1) Compartment Modules: #1, #2, #4, #5, #8, #9, #10, #11, #12, #15, #1

2. Lock

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of framing and reinforcements, and other conditions affecting performance.

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

3.2 INSTALLATION

A. Install units with no variations in flushness of adjoining surfaces.

B. Install units without distortion to fit the openings, are aligned, and are uniformly spaced.

C. Install units level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten units to adjacent units and to backing.

3.3 ADJUSTING AND CLEANING

A. Clean units on exposed and semi-exposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 123530
SECTION 122200 - CURTAINS AND DRAPES

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 draperies and drapery tracks.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Tracks: Include maximum weights of draperies that can be supported.
   a. Motorized Tracks: Indicate motor weights, motor-mounting requirements, and electrical requirements.

2. Fabrics.

B. Shop Drawings:

1. Tracks: Show installation and anchorage details and locations of controls.
   a. Motorized Tracks: Indicate dimensions, weights, and required clearances for track and motor and differentiate between manufacturer-installed and field-installed wiring.

2. Draperies: Show sizes, locations, and details of installation.

C. Samples for Verification: As follows:

1. Tracks: 18 inches long, with carriers, controls, and accessories.
2. Drapery Fabrics Samples for Verification: Memo sample.

D. Product Schedule: For draperies and drapery tracks. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For track installation; reflected ceiling plans drawn to scale and coordinating track installation with openings and ceiling-mounted items. Show the following:

1. Suspended ceiling components.
2. Structural members to which motors are attached.
3. Size and location of motor access panel.

B. Qualification Data: For Installer.
C. Recycled Content: Manufacturer's or fabricator's certificate indicating percentage of post-consumer recycled content by weight and pre-consumer recycled content by weight for each Product specified under this Section. Document the material cost of each Product.

D. Rapidly Renewable Materials: Manufacturer's documentation declaring type and percentage of rapidly renewable materials contained in each product. Document the material cost of each rapidly renewable component.

1.5 CLOSEOUT SUBMITTAL

A. Maintenance Data: For products to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: For draperies and tracks, fabricator of draperies.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before drapery fabrication, and indicate measurements on Shop Drawings.

B. Scheduling: Do not deliver or install draperies until after other finish work, including painting, is complete and spaces are otherwise ready for occupancy.

PART 2 - PRODUCTS

2.1 DRAPERY TRACKS

A. Manually Operated Track:

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, Silent Steel, 280 Series Track (basis-of-design)

2. Corded Window Covering Product Standard: Provide drapery tracks operated by pull cords complying with WCMA A 100.1.
   a. Provide No 2028 Cord
   b. Provide #2865 Tension Floor Pulley

3. Construction: Heavy Duty, 14 gauge galvanized steel, slotted for mounting at interval of not more than 24 inches o.c.
   a. Lengths and Configurations: As indicated on Drawing Schedule A9/A030.
   b. Support Capability: Verify weight of drapery listed on Schedule A9/A030, mounted on track length indicated.
   c. Finish: Manufacturer's standard.

4. Mounting Brackets: Steel, of type suitable for fastening track to surface indicated and designed to support weight of track assembly and drapery plus force applied to operate track.
   a. Provide No. 2800 channel for direct ceiling suspension
b. Provide No 2808 Hanging Clamp and No 2824 Suspended Slicing Clamp for suspended tracks.
c. Provide No 2807 Lap Clamp for suspended bi-parting tracks at the center overlap

d. Provide Pipe Batten for long and heavy curtain installations.
e. Mounting Surface: .GWB Ceiling or pipe suspension.

5. Installation Fasteners: Sized to support track assembly and drapery, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.


a. Pulley Mounting Location: Wall or Floor.
b. Draw: As indicated on Drawings.
c. Operating Hardware Location: As indicated on Drawings.

7. Carriers: Coordinate with drapery headings indicated.

a. Master Carriers: No 2802 Overlap.
b. Single Carrier: No 2801

8. End Stops: No 2809 Manufacturer's standard with track end cap.


10. Accessories: No 3825 Rubber Bumper.

B. Motorized Track:

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 (Basis of Design):

      1) Silent Steel, 280 Series Track
      2) Rig-I-Flex, 140 Series Track
      3) Silver Service Inline Machine, 2914 (with 140 series track)
      4) Silver Service Autodrape Machine, 1454 (with 280 series track)

2. 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.

3. Construction:

   a. 280 Series Track: Heavy Duty, 14 gauge galvanized steel, slotted for mounting at interval of not more than 24 inches o.c.
   b. 140 Series Track: 11 gauge extruded aluminum I-Beam construction
   c. Lengths and Configurations: As indicated on Drawings Schedule A9/A030.
   d. Support Capability: Verify weight of drapery listed on Schedule A9/A030,mounted on track length indicated.
   e. Finish: Manufacturer's standard.

4. Mounting Brackets: Suitable for fastening track to surface indicated and designed to support weight of track assembly and drapery plus force applied to operate track.
a. 280 Series Track: Curtain tracks shall be of 14 gauge galvanized steel construction, entirely enclosed except for slot in bottom, each half to be in one continuous piece except where splicing clamps are required. Each curtain carrier shall be spaced on 12-inch centers and shall be of nylon construction supported from a ball-bearing by two polyethylene wheels held to ball-bearing by rustproof nickel plated rivet, such wheels rolling on two separate parallel treads. Each curtain carrier shall consist of a free moving plated swivel an sufficient trim chin to accommodate curtain snap hook. Live-end pulley and dead-end pulleys shall be adjustable and shall be equipped with 3” diameter sleeve-bearing wheels adequately guarded. A rubber bumper shall be attached to each curtain carrier to function as noise reducer. The manufacturer shall furnish two end stops for placement on each track end and tension floor pulley for increasing cord tension. Stretch-resistant operating cord shall have synthetic or wire center and shall be 3/8-inch or 3/16-inch diameter. If Back Pack devices are used with this track, use Model 2834 for machine operated track systems.

1) Provide No 2801 (BL) curtain carrier.
2) Provide No. 2803(BL) live-end pulley and No 2804 (BL) dead-end pulley.
3) Provide No. 2809 (BL) end stops
4) Provide No. 2865 (BL) tension floor pulley
5) Provide No. 3529 operating cord for machine operation.
6) Provide No. 2800 channel for direct ceiling suspension
7) Provide No 2808 Hanging Clamp and No 2824 Suspended Slicing Clamp for suspended tracks.
8) Provide No 2807 Lap Clamp for suspended bi-parting tracks at the center overlap
9) Provide No. 2865 (BL) tension floor pulley
10) Provide No. 3529 operating cord for machine operation.
11) Provide No. 2800 channel for direct ceiling suspension
12) Provide No. 4208 Hanging Clamp for suspended tracks
13) Provide No. 1423 Ceiling Clamp for direct ceiling suspension.
14) Provide Pipe Batten if required.
15) Mounting Surface: GWB Ceiling or pipe suspension.

b. 140 Series Track: Curtain tracks shall be of 11 gauge extruded aluminum I-Beam construction consisting of a center rib and top, intermediate and bottom flanges. Each curtain carrier shall be spaced on 12” centers and shall be of steel construction to include two nylon-tired ball bearing wheels rolling on two separate parallel treads. Each curtain carrier shall consist of a free-moving plated swivel to accommodate curtain snap hook. Live-end and Dead-end pulley blocks shall be equipped with sleeve-bearing wheels adequately guarded. Nylon snap-on spacers shall be attached to wheel supports of curtain carriers. The manufacturer shall furnish two end stops for placement at track ends and a tension floor pulley for increasing cord tension. Track shall be rigidly supported from ceiling claps or hanging clamps. Stretch-resistant operating cord shall have synthetic or wire center and shall be of 1/4” or 3/16” diameter. 1-14/ I.D. stiffening pipe or the equivalent shall be used to support, as required.

1) Provide No 4201 (BL) carrier
2) Provide live-end No 1403 and dead end No. 1404
3) Provide two end stops No 4209 (BL)
4) Provide tension floor pulley No 2865 (BL)Provide No. 1400 Channel
5) Provide No. 4208 Hanging Clamp for suspended tracks
6) Provide No. 1423 Ceiling Clamp for direct ceiling suspension.
7) Provide Pipe Batten if required.
8) Mounting Surface: GWB Ceiling or pipe suspension.
9) Provide Pipe Batten for long and heavy curtain installations.
10) Provide Pipe Batten if required.
11) Mounting Surface: GWB Ceiling or pipe suspension.

5. Installation Fasteners: Sized to support track assembly and drapery, and fabricated from metal compatible with track, brackets, and supporting construction. Provide two fasteners to fasten each bracket to supporting construction.

6. Motor Operation, Silver Service Model No. 2914: Low-voltage motor with built-in low-voltage interface for direct access to control systems, with thermal-overload switch; sized for weight of drapery and track length indicated; and equipped with stops to prevent overdrawning.

a. Use with 140 Series Track.
b. Control: Coordinate control with the AV tablet control panel.
c. Draw: As indicated on Drawings.
d. Electrical Requirements:

1) Horsepower: 1/2
7. Motor Operation, 1454 Autodrape: Low-voltage motor with built-in low-voltage interface for direct access to control systems, with thermal-overload switch; sized for weight of drapery and track length indicated; and equipped with stops to prevent overdrawing.
   a. Use with 280 Series Track
   b. Control: Coordinate control with the AV tablet control panel
   c. Draw: As indicated on Drawings
   d. Mounting: Floor mounted on steel base
   e. Electrical Requirements:
      1) Horsepower: 1/2
      2) Volts: 120
      3) Control Voltage: 24 VAC
      4) Cable Speed: 98/45 fpm
      5) Size: 18 x 11 inches x 9 inches high
      6) Weight: 45 lbs.

8. Carriers: Coordinate with drapery headings indicated.
   a. Master Carriers: Overlap.

9. End Stops: Manufacturer's standard with track end cap.

2.2 DRAPERIES

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. Provide substitution request to Architect for approval:

B. Source Limitations: Obtain each color and pattern of drapery fabric and trim from one dye lot.

C. Drapery:
   1. Heading:
      a. Box Pleats: 75 percent fullness.
      b. Pleat Spacing: 5 inch pleats, sewn 12" apart
      c. Heading Accessories:
         1) 3 inch jute or polypropylene webbing, #4 grommets every 12 inches from the center.
         2) Snap hook, as required.

2. Drapery Fabric:
   a. Manufacturer: KM Fabrics
   c. Color: As selected by Architect from full range of Manufacturer's colors.
      1) CD1: Color 1 (280 manual track)
2) CD2: Color 2 (280 manual track)
3) CD3: Color 3 (280 track with autodraper)
4) CD4: Color 4 (280 track with autodraper)
5) CD5: Color 5 (140 track with inline motor)

d. Fiber Content: 100% Cotton
e. Orientation: Run right (up the bolt).
f. Width: 54 inches

3. Lining Fabric:

a. Lining Type: Blackout.
b. Manufacturer: Selected by fabricator for use with drapery fabric indicated
c. Manufacturer's Designation: Blackout
d. Fiber Content: 70% Polyester, 30% Cotton Substrate
e. Width: 54 inches
f. Textile Treatments: Inherently Flame Retardant


2.3 DRAPERY FABRICATION

A. Fabricate draperies in heading styles and fullnesses indicated. Fabricate headings to stand erect. If less than a full width of fabric is required to produce panel of specified fullness, use equal widths of not less than one-half width of fabric located at ends of panel.

1. One-Way-Stacking Draperies: Add 5 inches to overall width for returns.
2. Center-Opening Draperies: Add 10 inches to overall width for overlap.

B. Seams: Sew vertical seams with twin-needle sewing machine with selvage trimmed and overlocked. Join widths so that patterns match and vertical seams lay flat and straight without puckering. Horizontal seams are not acceptable.

C. Side Hems: Double-turned, 1-1/2-inch wide hems consisting of three layers of fabric, and blindstitched so that stitches are not visible on face of drapery.

D. Bottom Hems: Double-turned, 4-inch wide hems consisting of three layers of fabric, and weighted and blindstitched so that weights and stitches are not visible on face of drapery.

1. Sew in square lead weights at each seam and at panel corners.

E. Linings: Equal to widths of drapery fabric and joined to drapery fabric at top by inside invisible seam, and hand stitched at side hems and shadowed with 1-1/2-inch return of face fabric.

2. Finish 2 inches shorter than the face fabric.
3. Attach lining to the face fabric at seams along the bottom hem line and at intervals on side hems by 4-inch sections of 3/4 inch wide heavy woven tape.

PART 3 - EXECUTION

3.1 DRAPERY TRACK INSTALLATION

A. Install track systems according to manufacturer's written instructions, level and plumb, and at height and location in relation to adjoining openings as indicated on Drawings.
B. Isolate metal parts of tracks and brackets from concrete, masonry, and mortar to prevent galvanic action. Use tape or another method recommended in writing by track manufacturer.

3.2 DRAPERY INSTALLATION

A. Where draperies abut overhead construction, hang draperies so that clearance between headings and overhead construction is 1/4 inch.

B. Where draperies extend to floor, install so that bottom hems clear finished floor by not more than 1 inch and not less than 1/2 inch.

C. Where draperies extend to windowsill, install so that bottom hems hang above sill line and clear sill line by not more than 1/2 inch.

3.3 ADJUSTING

A. After hanging draperies, test and adjust each track to produce unencumbered, smooth operation.

B. Steam and dress down draperies as required to produce crease- and wrinkle-free installation.

C. Remove and replace draperies that are stained or soiled.

END OF SECTION 122200
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SECTION 122413 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers.

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ALLOWANCES

A. Roller shades are part of Section 012300 Alternates - Add Alternate #1.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

1. Motor-Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches long.

D. Roller-Shade Schedule: Use same designations indicated on Drawings.
1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by [manufacturer and witnessed by a qualified testing agency] [a qualified testing agency].

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.7 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.  Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.10 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, 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: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Draper FlexShade or comparable product by one of the following:

1. Draper Inc.
3. MechoShade Systems, Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS [SR1]

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Manufacturer's standard.
   a. Loop Length: Full length of roller shade.
   b. Limit Stops: Provide upper and lower ball stops.
   c. Chain-Retainer Type: Chain tensioner, sill mounted.

   a. Provide for shadbands that weigh more than 10 lb or for shades as recommended by manufacturer, whichever criteria are more stringent.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadbands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadbands for service.

1. Roller Drive-End Location: As indicated on Drawings.
2. Direction of Shadband Roll: Regular, from back of roller.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadbands:

2. Shadband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Installation Accessories:

1. Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Manufacturer's standard height required to enclose roller and shadband when shade is fully open, but not less than 3 inches.

2. Endcap Covers: To cover exposed endcaps.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.
2.3 MOTOR-OPERATED, DOUBLE-ROLLER SHADES [SR2]

A. Motorized Operating Systems: Provide factory-assembled, shade-operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-rewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Manufacturer's standard tubular, enclosed in rollers.
3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
   a. Keyed Control Station: Keyed, maintained -contact, three-position, switch-operated control station with open, close, and off functions. Provide two keys per station.
   b. Color: As selected by Architect from manufacturer's full range.
4. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shades for service.

1. Double-Roller Mounting Configuration: Offset, outside shade over and inside shade under.
2. Inside Roller:
   a. Drive-End Location: As indicated on Drawings.
   b. Direction of Shadeband Roll: Regular, from back of roller.
3. Outside Roller:
   a. Drive-End Location: As indicated on Drawings.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

D. Inside Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Outside Shadebands:

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
2.4 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

2. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
4. Thickness: .025 to .028 inches.
5. Weight: 11.8 to 14.6 oz./sq. yd.
7. Orientation on Shadeband: Up the bolt Railroaded.
8. Openness Factor: 3 percent.
9. Color: As selected by Architect from manufacturer's full range.


2. Type: Fiberglass textile with PVC film bonded to both sides.
3. Thickness: 0.013 inch to 0.015 inch
4. Weight: 12 oz./sq. yd.
5. Roll Width: 72 inches.
7. Color: As selected by Architect from manufacturer's full range.

2.5 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 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 of the Work.

B. 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.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor-operated roller shades to building electrical system.

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 motor-operated roller shades.

END OF SECTION 122413
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SECTION 140548 – VIBRATION ISOLATION OF CONVEYING SYSTEMS

PART 1 - GENERAL

1.1 SCOPE:

A. Certain systems and components of the project are intentionally designed to avoid vibration problems. Vibration isolation systems are more critical than “standard construction.” The Contractor is cautioned not to overlook these specific components in favor of “standard construction practices” in any pricing, submittal, or construction procedure.

1.2 Mount rotating and/or reciprocating equipment and piping on vibration isolators as noted in these Documents. Select, install and adjust isolators to prevent the transmission of objectionable vibration and noise to the building structure.

1.3 RELATED WORK:

A. Perform vibration isolation work in this contract, including work described in other Divisions to meet the product and execution requirements of this Section.

1. Division 1 – General Requirements.

2. Concrete – Division 3.

3. All Division 14 specifications relating to vibration isolated equipment and materials.


1.4 QUALITY ASSURANCE:

A. Provide vibration isolators and equipment bases for Divisions 14, 21, 22, 23, 26, 27 from the product line of a single manufacturer whenever possible unless approved by the project Acoustics Consultant. Isolators not supplied by the primary vibration isolator manufacturer shall be rejected.

1. The vibration isolator manufacturer’s representative shall determine isolator sizes and mountings, and shall provide field supervision and inspection to assure proper installation, adjustment and performance. Representative shall alert the Engineer and project Acoustics Consultant to any isolator selections, which may experience resonance with the approved equipment and upgrade any isolators that are found to resonate with the supported equipment. The Contractor shall include in his bid vibration isolation system elements as recommended by the manufacturer’s representative to make a complete, correct, and safe installation. Supply and install any incidental materials needed, even if not explicitly specified or shown in the Construction Documents, without claim for additional payment.

2. Skilled workers who are experienced in the necessary crafts to meet the requirements of this Section shall perform the work.
1.5 SEISMIC RESTRAINT

A. Seismic Certification: A licensed professional engineer experienced in the design of seismic restraints for flexibly mounted equipment, in the employ of the vibration isolation manufacturer, shall certify and stamp the shop drawings stating that all requirements of state and local codes have been met regarding seismic restraint of all resiliently mounted equipment. Provide calculations and analysis showing compliance with the applicable codes.

1.6 SUBMITTALS:

A. Vibration Isolation Mounts and Hangers: In a single consolidated submittal, provide catalog datasheets, shop drawings and other documents as necessary to indicate equipment unit number, isolator type, supported weight, scheduled deflection, proposed deflection under operating load, mount/pad/spring free height, spring solid height (at coil bind), spring diameter, mount/pad/spring operating height for each isolator. Submittals based upon rated deflection will be rejected. Indicate the weight and lowest rotational or reciprocal speed of each piece of isolated equipment. Indicate bridge bearing quality neoprene components and neoprene durometer where provided. Use the format below to summarize isolator characteristics for submittal review by the Engineer and project Acoustics Consultant. Submittals will be reviewed for compliance and a Review/Comment sheet returned to the Architect and Engineer for their use.

B. Elastomeric Pads: For pads supporting equipment (not piping), submit calculations showing supported weight, required deflection, pad support area, load per square inch, operating deflection, unloaded pad height (not including shims and top plate) and percent deflection. Indicate bridge-bearing quality neoprene where provided.

C. SAMPLE SUBMITTAL FORMAT: PAD

<table>
<thead>
<tr>
<th>Supported Equipment</th>
<th>ELEVATOR UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isolator Type</td>
<td>Mason SWM-40</td>
</tr>
<tr>
<td>Supported Weight</td>
<td>120 LB</td>
</tr>
<tr>
<td>Scheduled Deflection</td>
<td>0.10 inch</td>
</tr>
<tr>
<td>Operating Deflection</td>
<td>0.11 inch</td>
</tr>
<tr>
<td>Mount (Pad) Free Height</td>
<td>0.75 inch</td>
</tr>
<tr>
<td>Operating Height</td>
<td>0.64 inch</td>
</tr>
<tr>
<td>Pad Support Area</td>
<td>4 sq. in.</td>
</tr>
<tr>
<td>Remarks</td>
<td>Bridge bearing quality neoprene, 40 durometer</td>
</tr>
</tbody>
</table>

D. Concrete Inertia Bases: Provide shop drawings showing all steel work, required concrete, and method of isolator attachment, and location of equipment attachment bolts.

E. Shop Drawings: Submit shop drawings and manufacturer's installation instructions for sway braces wherever they are required. Submit shop drawings for piping isolation details where Type A pads are used.

F. Inspection Report: Upon completion of the installation and after the system is put into operation, the manufacturer's representative shall make a final inspection and submit his report to the Architects and Engineers in writing certifying the correctness of installation and compliance with approved submittal data. The contractor shall allow for the cost of this service in his bid.

1.7 DRAWINGS ARE SCHEMATIC ONLY.

A. Choose the size and number of mounts and hangers to meet these specifications. Provide brackets, rails, bases, braces, snubbers, etc. as needed for a complete and correct installation.
1.8 STANDARDS:

A. American Association of State Highway and Transportation Officials Standard Specifications for Highway Bridges (AASHTO), Highway Bridge Specification. See Table B requirements for physical properties of bridge-bearing quality neoprene.

PART 2 - PRODUCTS

2.1 SPRING REQUIREMENTS:

A. Steel springs and neoprene elements shall have static deflections under operating load equal to or greater than deflections shown in this specification section. Submittals based on rated deflection will be disapproved.

B. All steel springs as installed shall have a minimum additional travel to solid (coil bind) equal to 50% of the deflection under operating load.

C. Spring diameter shall be no less than 80% of the compressed height of the spring at operational load.

D. Steel springs shall not be welded to other elements of the isolator unless specifically noted in the submittal and approved by the project Acoustics Consultant.

E. Steel springs shall not take a permanent set when compressed to coil bind.

F. Steel springs shall be color coded to allow positive identification after installation.

2.2 ELASTOMER REQUIREMENTS:

A. All elastomeric (neoprene) components shall be selected for maximum hardness of 40 durometer, shore A rating, where possible. In no case shall hardness exceed 50 durometer. Use bridge-bearing quality neoprene meeting AASHTO Highway Bridge Specifications in all elastomeric components where installed in irretrievable locations and as noted elsewhere in the documents.

2.3 CORROSION RESISTANCE:

A. All isolators and associated hardware shall be designed or treated for resistance to corrosion. Steel components shall be PVC coated, or phosphated and painted with industrial grade enamel. All nuts, bolts and washers shall be zinc electroplated. Structural steel bases and exposed steel components of concrete inertia bases shall be cleaned of welding slag and primed with zinc-chromate or metal etching primer. A finish coat of industrial grade enamel shall be applied over the primer.

1. All isolators exposed to the weather shall have steel parts PVC coated, hot-dip galvanized or zinc-electroplated plus coating of Neoprene or Bitumastic paint. Aluminum components for outdoor installation shall be etched and painted with industrial grade enamel. Nuts, bolts, and washers may be zinc-electroplated.
2.4 MANUFACTURERS

A. THE FOLLOWING VIBRATION CONTROL MANUFACTURERS will be approved providing mounting systems are in strict accordance with design intent as specified herein:

2. Kinetics Noise Control, Dublin, Ohio.
4. Parker Hannifin Corp, Cleveland, Ohio.
5. Eaton, Cleveland, Ohio.

Since manufacturers’ products vary, specific models listed in this Specification may not be approved if they do not meet all requirements in this section. Model designations listed herein are intended only as a guide.

2.5 TYPE B: NEOPRENE-IN-SHEAR FLOOR MOUNT ISOLATORS

A. shall have steel bottom plates with bolt holes for bolting to foundations, a threaded steel insert at top of the mounting for attaching equipment, and friction surfaces both top and bottom. All metal surfaces shall be neoprene covered to resist corrosion. Mounts shall be double deflection and designed for a minimum static deflection as required in section 3 of this specification. Maximum mount deflection is 0.35 inches at rated load. Neoprene shall meet conditions of Paragraph 2.02: ELASTOMER REQUIREMENTS. Isolators shall be Mason model ND, Amber-Booth model RVD, Kinetics model RD or approved equal.

2.6 TYPE D: OPEN SPRING FLOOR MOUNT ISOLATORS

A. shall be freestanding and laterally stable with no housing, and shall have leveling adjustment bolts, which shall be rigidly connected to the equipment. Size and select isolators for deflection as required in section 3 of this specification. Springs shall meet conditions of Paragraph 2.01: SPRING REQUIREMENTS. Provide with 1/4” minimum elastomeric friction pad Type A between the base plate and the support. Pad shall meet conditions of Paragraph 2.02: ELASTOMER REQUIREMENTS. Vibration isolator vendor shall size elastomeric pads and associated load distributing shim plates to achieve deflection equal to 10 - 20% of the vertical thickness of the pads. Isolators shall be Mason model SLF, Amber Booth model SW, Kinetics model FDS or approved equal.

2.7 TYPE L: INERTIA BASES

A. shall be formed of stone-aggregate concrete (150 lbs./cu. ft.) and appropriate steel reinforcing cast between perimeter structural steel channels. Inertia bases shall be built to form a rigid base, which will not twist, deform, deflect, or crack in any manner that would negatively affect the operation of the supported equipment or the vibration isolation mounts. Inertia bases shall be adequately sized to support basic equipment units and motors plus any associated pipe elbow supports, electrical control elements, or other components closely related and requiring resilient support in order to prevent vibration transfer to the building structure.

The vibration isolator manufacturer shall supply the steel frame and reinforcement. The General Contractor may provide concrete.

Inertia base shall be equal to or greater than the weight of the pump and full tank of hydraulic fluid. Locate the center of gravity of the pump and tank as close as possible to the physical center of the on the inertia base. Spacing between isolators supporting the inertia base shall be a maximum of ten times the thickness of the inertia base. Bases shall have a minimum operating clearance of 2” above floor or housekeeping pad. Select springs to ensure minimum static deflection per section 3 of this specification is maintained.
when the hydraulic tank is empty, and that the 2” clearance is maintained when the hydraulic tank is full. Use height saving brackets as required to maintain proper clearances. Basis of design: Mason Industries KSL (or similar) Base with inset spring isolators.

2.8 TYPE P: CAPTIVE NEOPRENE WALL MOUNT ISOLATORS

A. shall be Mason model RBA, RCA, Kinetics model RQ, or approved equal.

2.9 ELASTOMERIC GROMMETS

A. may be a combination of neoprene washer and bushing, Mason models HLW and HLB or approved equal. Otherwise they shall be E.A.R. (Indianapolis, Indiana) Isodamp, C-1000, ring bushing and washer combination or approved equal. Elastomer shall be 40 durometer maximum. Grommets shall be formed to prevent bolts from directly contacting the secured item.

2.10 FLEXIBLE CONDUIT:

A. Refer to Section 26 05 48: Vibration Isolation of Electrical Systems.

2.11 HYDRAULIC HOSE:

A. Parker Hannifin P35, Parker Hannifin 787TC, or Eaton Aeroquip MatchMate Plus 00 (or comparable) Hydraulic Hose to be sized for the appropriate dimensions to match the hydraulic piping, and rated per the Elevator Engineer to ensure the hose can handle working pressures of the elevator system. Sufficient slack must be accommodated to address compression that occurs when Pump is in operation. Fittings to hydraulic piping per Elevator Engineer.

2.12 HYDRAULIC LINE ISOLATION:

A. Hydraulic line within the trench shall be vibration isolated with Mason model ND isolators or approved equal.

PART 3 - EXECUTION

3.1 GENERAL:

A. Resiliently mount equipment and piping on or suspended from approved foundations and supports, with isolation mounts, hangers, and/or pads as specified herein and as shown on drawings. Install seismic restraints in strict conformance with the certified shop drawings. Select locations of isolation equipment for ease of inspection and adjustment as well as for proper operation. Contractor shall cooperate with the Architect and project Acoustics Consultant to replace, at no additional cost to the Owner, any isolators that need to be upgraded from what is shown on the drawings if equipment operation results in resonance with building natural frequencies.

3.2 MOUNTS AND HANGERS

A. Align vibration isolators squarely above or below mounting points of the supported equipment.

B. For equipment with bases, locate isolators on the sides of the base that are parallel to the equipment shaft.
C. If a housekeeping pad is provided, isolator base plates shall rest entirely on the pad.

D. Position vibration isolation hangers as high as possible in the hanger rod assembly but not in contact with the building structure. Provide 1” minimum to 3” maximum clearance between hanger housing and structure above. Provide side clearance for hanger housings to allow a full 360-degree rotation about the rod axis without contacting any object.

E. Limit stops shall be out of contact during normal operation.

F. Adjust all leveling bolts and hanger rod bolts so that the isolated equipment is level and in proper alignment with connecting ducts or pipes.

3.3 DEFLECTIONS:

A. Design vibration isolation systems to have deflections equal or greater than indicated on drawings and listed in this specification section. Where multiple deflection requirements apply to a single isolator, the greater deflection shall prevail. Isolators supporting equipment with center of gravity that is asymmetrical in plan shall be selected for nearly equal deflection under actual load. Vibration isolation manufacturer shall determine number and size of mountings. Install isolators in accordance with manufacturer’s instructions.

3.4 ISOLATED SYSTEMS SHALL BE INDEPENDENT.

A. Do not hang or support piping, ductwork, conduit or mechanical equipment on other equipment, pipes or ductwork installed on vibration isolators. Maintain 2” clearance between isolated equipment and walls, ceilings and other equipment. Do not allow drain piping connected to vibration-isolated equipment to contact the building structure or other non-isolated systems unless it is resiliently mounted.

3.5 TREAT ALL ISOLATION SYSTEMS FOR CORROSION RESISTANCE.

A. Repair coatings damaged during installation.

3.6 ELEVATOR HYDRAULIC UNIT:

A. Mount elevator hydraulic units on Type L Inertia Bases with open spring floor mount isolators Type D. Isolators selected for minimum 2” static deflection. All utilities that attach to this equipment to have sufficient length of flexible connector to allow equipment to move freely.

3.7 HYDRAULIC ELEVATOR MUFFLER:

A. Connect Hydraulic Elevator Muffler in Hydraulic piping as close to pump as is feasible.

3.8 HYDRAULIC HOSE:

A. Install this hose between the elevator hydraulic unit after the muffler and before the first associated pipe support or hanger. This Hose must be installed with sufficient slack to accommodate compression that occurs in operation, and must have a minimum 3’ of run to allow for free movement of pump. Install hose in easily visible locations for inspection and replacement purposes.
3.9 HYDRAULIC PIPING ISOLATION:

A. All hydraulic lines shall be resiliently supported from slab on grade using neoprene-in-shear floor mount isolators Type B, with a minimum 0.25" static deflection, and shall be flexibly connected as approved by the project Acoustics Consultant.

B. The installation or use of vibration isolators shall not cause any change of position of piping which will result in stresses in piping connections or misalignment of shafts or bearings. In order to meet this objective, maintain equipment and piping in a rigid position during installation. Do not transfer the load to the isolators until the installation is complete and under full operational load.

3.10 FLEXIBLE CONDUIT:

A. Use to isolate vibration from all equipment requiring vibration isolation per this specification section. Flexible conduit shall be a minimum length of 12" with 25% greater length than the separation between the isolated equipment and the termination of rigid conduit. Install the flexible conduit to be slack and not to exceed the manufacturer's minimum recommended bending radius. For conduit sizes greater than 2" diameter, use pre-manufactured flexible conduit connectors instead of flexible conduit. Refer to Section 26 05 48: Vibration Isolation for Electrical Systems for further information.

END OF SECTION 140548
SECTION 142400 - HYDRAULIC PASSENGER ELEVATOR

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. General Provisions of Contract, including general and supplementary conditions, special conditions and Division I Specification sections, apply to work of this section.

B. Provide all labor, materials, services, and equipment necessary to complete the installation of the elevator as specified herein.

C. Drawings and specifications are intended to show general arrangement, design, and extent of work. As such they are not intended to be scaled for roughed-in measurements or to serve as shop drawings.

D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any work which is obviously necessary to complete the Project, within the limits established by the drawings, specifications and codes, although not shown on or described therein, shall be performed by the Contractor as part of their work.

1.2 DESCRIPTION OF WORK

A. This section includes the installation of one (1) direct plunger, hydraulic service elevator in the School of Music New Building on the campus of the University of Missouri, Columbia, Missouri as follows and noted in the elevator schedule at the end of this Section.

1. This new hydraulic elevator is slated to be replaced with a traction elevator when a future expansion is added to the building therefore all components that would remain such as car frame, cab, etc. shall be designed for a traction elevator application.

B. Hydraulic elevator is defined to include a plunger & cylinder unit connected to the elevator platform which will raise and lower the elevator by using pumping units using oil as the medium complete with components, controls and devices as indicated as required for safely operating elevator at rated speed and capacity.

1.3 SUBMITTALS

A. Refer to Division 1 for additional information regarding submittals, including submittal requirements, processing procedures, and limitations of review.

B. Product Data: Submit manufacturer's technical product data and instructions for each principal component or product. List and describe features of control system, performances, and operating characteristics. Submit brochures of all signal and operational fixtures, control and drive equipment, hoistway door equipment, door operator, and door protective device.

C. Shop Drawings: Shop drawings shall be prepared by skilled draftsmen and presented in a clear and thorough manner as follows:

1. Job-specific Elevator Layout Drawings: Drawings shall include dimensional layout drawings for the elevator, showing plans, elevations, sections, and large scale details of hoistway and machine room indicating service at each landing, coordination with building structure, and relationships with other construction including, but not limited to, electrical and HVAC equipment. Indicate maximum dynamic and static loads imposed on building structure at points of support per the ASME A17.1 Safety Code for Elevators and Escalators. Indicate capacities, speeds, sizes, performances, operations, safety features, controls, finishes, and similar information on the layout drawings.

2. Fixture drawings: Submit job-specific, straight line dimensional drawings of all signal and operational fixtures.

4. Hoistway Entrance: Submit job-specific plans, elevations and details of wall interface.

5. Approval of shop drawings and cuts is for general arrangement only and does not include measurement, which is the contractor's responsibility, or approval of variations from the contract documents. The purpose of the shop drawing submittals by the contractor is to demonstrate to the owner the contractor understands the design concept and demonstrates an understanding of the equipment and materials to be furnished.

D. Samples: Submit samples of exposed finishes of the car enclosure, hoistway entrances, and signal equipment. Provide 6” to 8” square samples of sheet materials and 10” to 12” lengths of running trim members.

E. Diagnostic Tool: Upon completion of work provide diagnostic testing device, or maintenance terminal, suitable for all troubleshooting and testing procedures related to the specific type of microprocessor control. This diagnostic testing device, or maintenance terminal, shall conform to the operating procedures under the testing section of these specifications. Diagnostic device shall be installed in a lockable metal cabinet, mounted to the machine room wall.

F. Maintenance Manuals: Submit bound manuals for each elevator or group of elevators with operating and maintenance instructions, lubricating schedule and instructions, parts listing, recommended parts inventory listing for motor and critical components, diagnostic device operations manual, emergency instructions and similar information.

1. The diagnostic device operations manual shall be complete with adjustment settings, sequence of operation, and other diagnostic technical data required for adjustments, tuning, maintenance, and operation of the elevators including performance of all required acceptance and periodic testing required by the Elevator Code. User’s instruction manual shall include access codes required for accessing microprocessor equipment for adjusting or programming.

2. Provide three (3) copies of manual bound in standard three-ring, hard binders. Identify each binder with Owner's name.

3. Include a detailed "Maintenance Control Program", specific to the elevator, in each maintenance manual as required by Elevator Code. One (1) of the copies of the “Maintenance Control Program” shall be laminated and placed for use in the elevator control room. The MCP shall be set up to maintain the following documentation throughout the life of the elevator:

   a. A written description of all examinations and maintenance of equipment at scheduled intervals. Intervals shall be based on job specific characteristics including equipment age, condition, and accumulated wear, design and inherent quality of the equipment, usage, environmental conditions, etc.

   b. Instructions for cleaning, lubricating, and adjusting applicable components at regular intervals and repairing or replacing all worn or defective components where necessary.

   c. A description of tests of equipment at scheduled intervals.

   d. All Code required written procedures such as inspection, testing, and maintenance, and maintenance records. Maintenance records shall:

      1) document description of maintenance task performed and dates.

      2) list description and dates of examinations, tests, adjustments, repairs, and replacements.

      3) list description and dates of call backs (trouble calls) or reports that are reported to elevator personnel by any means, including corrective action taken.

      4) contain written record of the findings on the firefighter’s service operation.

   e. Up-to-date wiring diagrams detailing circuits of all electrical protective devices and critical operating circuits and shall be available in the elevator control room.

G. Wiring Diagrams: Provide two (2) sets of complete electrical circuit diagrams, and one (1) electronic copy in “.pdf” format on CD-ROM, for control and operational features as installed, showing location and wiring for power, signal and control systems. The diagrams shall differentiate clearly between manufacturer-installed wiring and field installed wiring. In addition, provide one (1) bound set of 11”x17” minimum, clear laminated wiring diagrams in the elevator machine room.
H. Keys: Provide six (6) sets of keys for all key fixtures on elevator equipment.

I. Certificate Frame: Provide a certificate frame in the elevator machine room mounted in a conspicuous location. Frame shall be made of a quality metal with a window size to house the operating certificate from the State of Missouri.

J. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates and operating permits as required by governing authorities to allow normal, unrestricted use of elevator. If any variances are required from the State of Missouri for the product installed they shall be obtained by the Contractor. Provide a copy of any variances to the Owner upon completion of the project.

K. Maintenance Certification: The Contractor shall submit a written certification, signed by the Contractor and the manufacturer of the equipment, making a commitment to provide direct support to the Owner, or the Owner’s elevator maintenance service representative, including availability of parts (for inventory, not on an “exchange only” basis), diagnostic tools, and technical & engineering support. In addition all parts and support shall be provided at a reasonable cost in line for which the original manufacturer would charge to its own customer base and response shall be in a timely manner. This commitment shall remain in effect for a minimum of twenty-five (25) years after substantial completion of the project.

1.4 QUALITY ASSURANCE

A. Installer Qualification: The elevator manufacturer, or a licensee of the manufacturer, who has a record of successful experience with the installation of similar elevators. The contractors shall have, as a minimum, the following qualifications and documentation verifying these qualifications shall be submitted prior to award:

1. Minimum of five (5) years successful experience in installing and servicing similar elevator installations.

2. Installed at least ten (10) completed and accepted elevator systems of similar size, scope, logic control, and motion control required by this contract.

3. An existing in-house administrative and technical organization staffed with competent personnel who are experienced in the elevator related work required to install and service the elevator system as specified.

B. Elevator Code: Except for more stringent requirements as indicated or imposed by governing regulations (which must be complied with), comply with applicable requirements of the ASME A17.1-2004 Safety Code for Elevators and Escalators up to and including the A17.1a-2005 addenda and the A17.1S-2005 supplement hereinafter referred to as the “Elevator Code” and the 2015 International Building Code, hereinafter referred to as the “Building Code”.

C. Seismic Requirements: Elevators shall meet the seismic requirements for risk zone 0 as stipulated in the Elevator Code, based on a Seismic Design Category of C and a component Importance Factor (Ip) of 1.0.

D. NEC Code: Comply with the NEC Code and specifically with sections relating to electrical work for elevators.

E. Fire Resistance of Entrances: Comply with NFPA No. 80 and provide units bearing appropriate UL labels or other equivalent testing agency.


G. Performance Requirements: Provide an elevator that meets the following performance requirements:

1. Speed: +/- 5% of specified contract speed under a full load condition in either direction.
2. Stopping Accuracy: 1/4 inch under any loading condition.
3. Floor to Floor Performance Time: 20.0 seconds. Time is measured from start of doors closing until doors are 3/4 open and car is level and stopped at the next successive floor under any loading condition or travel direction.
4. Door Close Time: 5.5 seconds.
5. Door Open Time: 4.5 seconds.
6. Door Open Dwell Time: 3.0 seconds car call / 5.0 seconds hall call.
7. Smooth acceleration and deceleration for comfort of ride.

1.5 INITIAL MAINTENANCE SERVICE AND WARRANTY

A. Maintenance Service: Furnish maintenance and callback service on the elevator for a period of twelve (12) months following date of final acceptance of all elevator work as specified herein. The maintenance and callback service shall include at a minimum, but not be limited to, the full maintenance requirements as follows:

1. Maintenance service shall be performed by skilled elevator personnel directly employed and supervised by the same company that furnished and installed the elevator equipment specified herein.

2. This service shall include:
   a. Monthly examination of the hydraulic unit as a minimum.
   b. Lubricating, adjusting, repairing and replacing of all parts as necessary to keep the equipment, including battery packs, in a first class condition and proper working order.
   c. Furnish all lubricants and parts required.
   d. Assure smooth and consistent operation of automatic hoistway doors and car doors.
   e. Assure smooth starting and stopping and accurate leveling at all times.
   f. Provide all periodic annual and maintenance testing in accordance with the Elevator Code.
   g. The contractor shall keep clean of all dirt and debris guide rails, top of car, bottom of platform, machine room, unit hoistway and pit. All necessary cleaning supplies and equipment shall be furnished by the contractor.
   h. An annual inspection, as described in the Elevator Code and/or as required by governing authorities, in the eleventh (11th) month of the new installation maintenance period. The units shall have the State annual inspection performed during one (1) of the three (3) summer months of the new installation service period. Coordinate exact dates with Owner and Owner supplied State Inspector.

3. The maintenance service shall not include the performance of any work required as a result of improper use, accidents or negligence, for which the contractor is not directly responsible.

4. All work shall be completed by trained employees of the elevator contractor and performed during normal working hours. Include 24 hour/day, 7 days/week callback service. Owner is responsible for overtime cost of said callbacks. Exclude only repair/replacement due to misuse, abuse, accidents, or neglect caused by persons other than installer’s personnel. Response to non-emergency service calls shall be within 2 hours of the call and response to emergency service calls shall be within 1 hour of the call. Emergency callbacks include, but are not limited to, the following:
   a. Incidents resulting in injury.
   b. Entrapments.

5. Contractor shall follow the procedure below when responding to any callbacks:
   a. Upon receiving a call, the service representative shall immediately send an email to Campus Facilities with an estimated arrival time. Exact email address will be provided to the successful installer.
   b. Upon arrival at the site, during normal working hours (7:30 am - 5:00 pm Mon.-Fri.), the service representative shall immediately call Campus Facilities at 573-882-8211 and inform them of their arrival.
   c. After work has been completed, the service representative shall send an email to Campus Facilities (Melissa Hayes at hayesm@missouri.edu) stating the status of the elevator and repair. The status shall include how long the elevator was or will be shut down and a description of the problem and solution.
6. The contractor shall maintain a log in the elevator machine room. The log shall list the date and time of monthly examinations and all trouble calls. Each trouble call shall be fully described including the nature of the call, necessary corrections performed and or parts replaced.

7. During the eleventh month of the new installation maintenance service period, a post warranty inspection shall be coordinated by the installing contractor to ensure the elevator is in a good state of maintenance repair and all maintenance manuals, diagnostic tools and Maintenance Control Program documents are in place. The inspection shall include the installing contractor, the Owner’s current campus elevator maintenance contractor and the Owner’s representative.

8. Maintenance service shall conform to the requirements of Section 8.6 of Elevator Code. This shall include the provision of a written Maintenance Control Program and maintenance record keeping that is consistent with Elevator Code requirements.

B. General Warranty: The elevator warranty specified in this section shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

C. Warranty: Provide special project warranty, signed by contractor, installer, and Manufacturer, agreeing to replace, repair/restore defective materials and workmanship of elevator work during warranty period. "Defective" is hereby defined to include, but not by way of limitation, operation or control system failures, performances below required minimums, excessive wear, unusual deterioration or aging of materials or finishes, unsafe conditions, the need for excessive maintenance, abnormal noise or vibration, and similar unusual, unexpected and unsatisfactory conditions. The warranty period is twelve (12) months starting on date of final acceptance of the elevator and shall be extended until "defects" as defined in this warranty are corrected.

PART 2 MATERIALS AND COMPONENTS

2.1 GENERAL

A. Provide manufacturer’s base pre-engineered elevator system with modifications or added features that will comply with the elevator work requirements as specified herein or, at manufacturer’s option, provide custom manufactured base elevator system that will comply with the requirements. Where components are not otherwise indicated, provide standard components, published by manufacturer as included in standard pre-engineered elevator systems, and as required for a complete system.

2.2 ELEVATOR MACHINERY AND CONTROL EQUIPMENT

A. Hydraulic Power Unit: The pumping unit shall be of integral design and shall include an electric motor connected to a pump, a hydraulic control system, storage tank, necessary piping connections, and a controller, all compactly designed as a self-contained unit. The pumping unit shall be located in the elevator machine room and the controller shall be mounted on the end of the machine or mounted on the wall of the machine room to meet NEC working clearance requirements. The hydraulic power unit shall be securely fastened to the machine room floor to prevent the tank from being overturned or displaced. Elevator contractor shall verify location and dimensions in general layout of machine room.

1. The hydraulic control system shall be a compact design suitable for operation under the required pressures and it shall be mounted in the storage tank. The control valve will be a manifold type with up, down and check valve sections. A control section including solenoid valves will direct the main valve and control up and down starting, transition from full speed to leveling speed, up and down stops, pressure relief and manual lowering. Down speed and up and down leveling shall be controlled at the main valve sections. All of these functions shall be fully adjustable for maximum smoothness and to meet contract conditions. All control systems shall be pre-adjusted at the factory. A manual lowering feature shall be provided to permit lowering the elevator at slow speed in the event of power failure or for adjusting purposes.
2. The pump shall be a positive displacement screw type to give smooth operation and shall be especially designed and manufactured for elevator service.

3. The motor shall be of the alternating current, poly-phase squirrel cage induction, dry type with solid-state, reduced starting current and shall be of a design especially adapted to electro-hydraulic requirements.

4. The storage tank shall be constructed of steel and shall be provided with a removable cover and a means to gauge the proper level of the oil. The pump, motor and control valve shall be mounted on special reinforced isolation mounts below the tank. Provide a drip pan underneath the unit. An initial supply of oil sufficient for proper operation shall be provided.

5. Provide a muffler in the discharge oil line near the pump unit designed to dampen and absorb pulsation and noise in the flow of hydraulic fluid.

6. Provide a manual shut off valve in the supply line adjacent to the pump unit.

B. Cylinder & Plunger (Jack Unit): All jack units shall be single-stage. The cylinder shall be constructed of steel pipe of sufficient thickness and suitable for the operating pressure per the Elevator Code. The top of the cylinder shall be equipped with a cylinder head with drip ring to collect any oil seepage as well as an internal guide ring and self-adjusting packing.

1. The plunger shall be constructed of selected steel tubing or pipe of proper diameter machined true and smooth with a fine polished finish. The plunger shall be provided with a stop ring electrically welded to it to prevent the plunger from leaving the cylinder. The plunger and cylinder shall be installed plumb and must operate freely with minimum friction. The plunger shall be securely mounted to the car frame and be isolated from the frame to eliminate any vibration from the jack unit to the car frame.

2. Pipe of adequate size and thickness shall be installed between the pumping unit and the cylinder head. Any piping running between a remote elevator machine room and the respective elevator hoistway shall be welded or threaded.

3. Well For Cylinder: Drill required well hole; remove excess excavated material from the site, and install a steel casing. Additionally case the cylinder in capped, watertight, PVC pipe, at least 1” larger in diameter than cylinder. The area between the steel casing and the PVC inner casing shall be back filled with clean washed sand. Construct a PVC flange to create a watertight seal between the PVC casing and the cylinder flange in the hoistway pit. Provide a means of testing the bottom seal and a means of evacuating any material that may enter the containment. The access risers should be capped to prevent water from entering the cavity should flooding occur in the hoistway pit.

   a. Base bid shall include drilling hole in dirt, sand, rock, gravel, loam, boulders, hardpan, water, or other natural obstacles. Include the removal of all dirt and debris from the project site.

4. Safety Valve: A safety valve shall be provided such that it will stop and hold the elevator car with rated load at any point when the maintained pressure drops below the minimum operating pressure. The safety valve shall be located in the pit as close as possible to the cylinder inlet/outlet and in the oil supply line to the cylinder. The valve shall be of the pressure sensitive mechanical type and shall not be electrically operated. The valve shall additionally be actuated by an oil flow rate not greater than 125% of the oil flow rate required to produce the operating speed in the down direction.

5. Oil Cooler Heat Exchanger: Contractor shall provide a fan-cooled heat exchanger for the oil in the hydraulic reservoir and shall be located in the elevator machine room. The oil cooler shall have the capability of removing 17,500 BTU/hr at 40º F temp delta. Oil Cooler to be as manufactured by MEI, model AOC or approved equal. Power source for oil cooler shall be provided by contractor through elevator control system such that no additional, separate electrical disconnects or circuits are required.
C. Controller:

1. A microprocessor computer based control system shall be provided to perform all of the functions of safe elevator motion and elevator door control and shall be one of the following control systems or approved equal:
   a. Motion Control Engineering – Motion 2000 (with onboard diagnostic keyboard and display)
   b. Vertitron Midwest Inc. VHC-102
   c. Otis Elevonic (with one Diagnostic Tool per Group and Adjustors Manual)
   d. ThyssenKrupp TAC32 (with one Diagnostic Laptop per Group and Adjustors Manual)

2. The controller shall be designed with a split cabinet to separate high voltage from low voltage for efficiency and safety of future maintenance and troubleshooting of the unit.

3. The controller shall include all the hardware required to connect, transfer, and interrupt power and protect car operational and group supervisory control. A three-phase overload device shall be provided to protect the motor against overloading.

4. Identify each device, module and fuse (with ampere rating) by name, letter, or standard symbol, in an indelible and legible manner on the device or panel. Coordinate identification markings with identical markings on wiring diagrams. Use light emitting diodes (LED) for visual monitoring of individual modules. Components shall have interlocking circuits to assure fail-safe operation and to prevent unwarranted elevator movement should any component fail to function properly. Modules shall be of the type that plug into pre-wired mounting racks. Field wiring or alteration shall not be necessary in order to replace defective modules.

5. The elevator shall be provided with an automatic leveling device that will bring the car to a stop within 1/4" of the landing level regardless of load or direction of travel. Landing level will be maintained within the leveling zone irrespective of the hoistway doors being open or closed.

6. A protective circuit shall be provided which will stop the motor and the pump and return the car to its lowest landing in the event that the car while traveling up, does not reach its designated landing within a predetermined time interval. This circuit shall permit a normal exit from the car but prevent further operation of the elevator until the trouble has been corrected.

7. Solid state, reduced current starting shall be furnished which shall limit both the initial starting current and peak current drawn by the motor.

8. The control equipment and hydraulic power unit enclosures shall be mechanically fastened to the machine room floor.

9. Design the system so that it will start properly when power is restored in the event of a power failure. Provide system memory so that data is retained in the event of power failure or disturbance.

10. Provide manufacturer's standard pre-engineered microprocessor system, which shall control car movements as a simplex collective operation. Provide automatic dispatching of the car in response to hall calls with automatic response of system to changes in demand.

11. A car control station shall be furnished for the elevator and shall contain a bank of buttons numbered to correspond to the landing served. At each terminal landing a single push button fixture shall be provided containing the appropriate up or down push button and at each intermediate landing a button fixture shall be provided containing up and down push buttons.

12. When a call is registered by momentary pressure on a car or landing button, that button shall become illuminated and remain illuminated until the call is answered. Illuminated buttons serve as a visual indication that a call has been registered and that the car will stop at that landing.

13. Operation shall be automatic by means of the car and landing buttons. Stops registered by the momentary actuating of the car and landing buttons shall be made in the order in which the landings are reached in each direction of travel after the buttons have been actuated. All stops
shall be subject to the respective car or landing button being actuated sufficiently in advance of the arrival of the car at the landing to enable the stop to be made. The direction of travel for an idle car shall be established by the first car or landing button actuated.

a. "UP" landing calls shall be answered while the car is traveling in the up direction and "DOWN" landing calls shall be answered while the car is traveling in the down direction. The car shall reverse after the uppermost or lowermost car or landing call has been answered, and proceed to answer car calls and landing calls registered in the opposite direction of travel.

b. When the car, without registered calls arrives at a floor where both the "UP" and "DOWN" calls are registered, it shall initially respond to the hall call in the direction that the car was traveling. When no car call or hall call is registered for further travel in that direction, the car shall close its doors and immediately reopen them in response to the hall call in the opposite direction. The hall lantern shall indicate the changed direction when the doors reopen.

14. A diagnostic testing device, or maintenance terminal, suitable for all troubleshooting and testing procedures related to the specific type of microprocessor control, shall be installed on this project and provided at the final acceptance. This diagnostic testing device, or maintenance terminal, shall conform to the operating procedures under the testing section of these specifications.

a. After successful testing of the diagnostic device, in conjunction with the microprocessor control, the testing device shall become the property of the Owner. The diagnostic testing device shall not become inoperative after a period of time requiring factory rehabilitation. The contractor shall provide written certification that repair and support of the diagnostic tool components is readily available to the Owner in the future.

b. When repairs or replacement to the testing device become necessary prior to the final acceptance, the repairs, or replacement, shall be provided at no cost to the Owner.

c. Diagnostic device shall be installed in a lockable metal cabinet, mounted to the machine room wall.

15. Additional special operations shall be included with the elevator control system:

a. Independent Service: A key switch shall be provided in the car operating station of the elevator which, when actuated, shall disconnect the elevator from the hall buttons and permit operation from the car buttons only. Close doors by constant pressure on desired destination floor button. Open doors automatically upon arrival at selected floor.

b. Top of Car Inspection Operation: Provide an operating fixture on top of the car containing continuous pressure "Up" and "Down" buttons for operating the elevator, an emergency stop button, a light and duplex GFCI receptacle, and a toggle switch that will make the top of car operating device operative.

c. Fireman's Emergency Service: Furnish emergency operation to return the elevator to the main fire access Floor 1 and return to the alternate Floor 2 when emergency is at main fire access floor. Furnish "in car" control of the elevator during emergency operation by means of a key switch in the car.

1) The appropriate signals from the fire alarm control system, as required to work in conjunction with the fireman’s phase I recall operation, shall be provided in the machine room by other sections. Coordinate exact signal requirements with fire alarm contractor to ensure proper operation and code compliance.

d. Hoistway Access Key Switch Operation: Key operated switches shall be provided in the car and at the top landing for selecting hoistway access operation. When the inspection switch in the car is turned to the "ON" position, the car is put on inspection operation and can only be run by use of the switch at the top landing.
1) The car parks with the doors open and the closing circuit rendered operative. The inspector runs the car at low speed with the doors open by constant operation of the switch located in the elevator lobby.

2) The car can be run down from the top floor to gain access to the top of the car. The movement of the car initiated and maintained by the upper access switch shall be limited in the down direction to a travel not greater than the height of the car crosshead above the car platform, and limited in the up direction to the distance the platform guard extends below the car platform.

e. Cart Loading Button: Provide a “Cart Loading” button on the car control station panel on each elevator such that when the button is activated it shall illuminate and the door dwell time shall increase to 30 seconds for the movement of carts on and off the elevator. The timing devices shall be adjustable to increase or decrease the additional door dwell time from zero to one hundred twenty seconds. The increased door time shall be canceled upon initiation of any car button. After increased door dwell time has expired the doors shall close and the elevator shall return to normal operation.

f. Controlled Access Operation - Card Reader: Car calls from car operating panel may be entered only in conjunction with the access control system which provides the elevator controller with signals to enable/disable car calls. A card reader, provided by others, shall be installed in the car station to provide authorized persons with ability to enter car calls for individual openings as determined by the access control system.

1) The contractor shall surface mount the card reader (as provided by other Sections) at the proper ADA/accessibility height on the face of the car control station panel. Wiring from the card reader shall be brought from the elevator car, through the traveling cable, and to the elevator machine room. Reader shall have a controller in the elevator machine room which shall be hard wired into the elevator control system under this section to individually enable/disable each car call button. Coordinate with other Sections and provide wiring between readers and controllers as directed by Access Control Installer.

2.3 CAR STRUCTURE

A. Platform: The car platform shall be all steel construction. The platform shall be equipped with extruded nickel-silver sills. The entire platform shall rest on a rubber pad, so designed as to form an isolation cushion between the platform and the plunger. The platform shall be provided with a platform guard and be protected with suitable fire retardant material to comply with the Elevator Code. The platform guard shall extend a minimum of 48” below the car sill. The platform shall be design for a traction application traveling at a speed of 200 fpm.

B. Car Frame: A suitable car frame fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosure. The buffer striking plate on the underside of the car frame plank members must fully compress the spring buffer mounted in the pit before the plunger reaches its down limit of travel. The car frame shall be designed for a traction elevator traveling at a speed of 200 fpm such that it may be retained with no modifications in the future when the elevator is transformed to a traction type and safeties and rope hitches are required.

C. Car Guides: Provide spring loaded, adjustable roller guide assemblies, with 6” diameter minimum rubber tired rollers. The roller guides shall be designed for a traction elevator application traveling at a speed of 200 fpm. Properly adjust for a smooth quality of ride. The assemblies shall be properly adjusted and aligned with the rails to provide a smooth quality of ride upon completion of the installation.

D. Top of Car Handrail: A standard railing, consisting of a top rail, intermediate rail, posts, and toe-board, shall be provided on the top of each elevator car. The top rail shall have a smooth surface and the upper surface shall be located at a vertical height of 42” from the top of the car. The intermediate rail shall be located approximately half-way between the top rail and the top of the car. Posts shall be located not more than 7’10” apart. The toe-board shall be securely fastened to the posts and extend from the top of the car to a height not less than 4”.
E. **Balance:** After all components are assembled on the car structure, the elevator car shall be statically balanced in alignment with the guide rails to equalize pressure for a smooth ride upon completion of the installation.

### 2.4 HOISTWAY COMPONENTS

A. **Guide Rails:** The elevators shall be furnished with steel elevator guide rails to guide the car. Rails shall be solid steel T-shaped rails. The rails shall be erected plumb and securely fastened to the building structure. Rails and fastenings shall be designed for a traction elevator application traveling at a speed for 200 fpm.

1. Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work where installation of devices is required by other sections.

2. Where elevator manufacturer requires a maximum rail bracket spacing dimension that is less than the distance between floor beams depicted on the Structural/Architectural drawings, elevator manufacturer shall include channel backing designed and installed by the elevator installer in this section.

B. **Hoistway Operating Devices:** Normal terminal stopping devices shall be provided. When an emergency terminal speed-limiting device is furnished, the controller switches and circuitry shall be arranged in accordance with the requirements of the Elevator Code.

C. **Pit Switch:** An emergency stop switch shall be located in the elevator pit within reach of the pit access door and 18 inches above the sill. A second stop switch shall be located adjacent to the pit access ladder and 4’ above the pit floor.

D. **Top of Car Operating Device:** A top of car operating device shall be provided and shall have the proper buttons, switches, and stop switch to operate the elevator on top of the car under inspection operation. The device shall be provided with a GFCI duplex receptacle and a guarded incandescent light.

1. If the stop switch on the top of car operating device is not within reach of the hoistway landing, a second stop switch shall be provided on the car top that is within reach of the hoistway landing.

E. **Wiring:** All wiring and electrical interconnections shall comply with the governing codes. Insulated wiring shall have flame retardant and moisture-proof outer covering, and shall be run in conduit, tubing or electrical wireways.

F. **Traveling Cable:** Traveling cables shall be flexible, with a flame and moisture resistant outer cover, and shall be suspended to relieve strain on individual conductors. Include the required number in addition to three (3) spare sets of shielded communication wires and car lighting circuits from the machine room to the car connection points on the elevator. Provide 10% spare wires in traveling cable.

G. **Spring Buffers:** Spring buffers shall be installed in the elevator pit as a means for retarding the movement of the car at the bottom limits of travel. Solid bumpers or polyurethane bumpers are not acceptable.

### 2.5 DOOR OPERATING SYSTEM

A. **Door Operator:** Doors on the car and at the hoistway entrances shall be power operated by means of a high speed, heavy duty, closed-loop, master door operator mounted on top of the car. The motor shall have positive control over door movement for smooth operation.

1. Door operation shall be automatic at each landing with door opening being initiated as the car arrives at the landing and closing taking place after expiration of a time interval. A car door electric contact shall prevent starting the elevator away from the landing unless the car door is in the closed position. Door close shall be arranged to start within a time consistent with accessibility requirements.

2. The time interval for which the elevator doors remain open when a car stops at a landing shall be independently adjustable for response to car calls and response to hall calls.
B. Interlocks: An approved positive interlock shall be provided for each hoistway entrance which shall prevent operation of the elevator unless all doors for that elevator are closed and shall maintain the doors in their closed position while the elevator is away from the landing.

1. Hoistway door unlocking devices shall be provided at all hoistway landings to permit access to the top of the car and pit areas. The unlocking devices shall be actuated by a special key and access holes in hoistway doors shall be protected by a naturally finished, barrel type escutcheon plate.

C. Car Door Safety Device: A proximity type, non-contact, infrared ray, door reversal device shall be furnished for the elevator entrance. Operation for all devices to be as follows:

1. The doors shall be prevented from closing from their full open position if a person or object comes within the zone of detection. The detection zone shall move with the doors and if a person or object enters the zone as the doors are closing, the doors shall reverse and reopen prior to physical contact. The doors shall reclose after a minimal time interval. After a stop is made, the doors shall remain open for a time interval to permit passenger transfer, after which the doors shall close automatically. This interval shall be less for a car call stop than for a hall call stop or a coincident car/hall call stop.

2. If the doors are prevented from closing for a fixed time period an audible chime shall sound on the car. When the object is removed from the zone of detection the doors shall close at reduced power and speed to below 2 1/2 ft.-lbs. of kinetic energy. If an object enters the zone of detection while the doors are closing at reduced power and speed the doors shall stall and not reopen. Once the object is removed from the zone of detection the doors will continue to close at reduced power and speed. This operation will continue until the doors are totally closed. Normal operation shall resume at the next landing reached by the car.

D. Car Door Restrictors: The door operating mechanism shall be arranged so that the car and hoistway doors cannot be opened by hand more than four inches from within the elevator car when the car is outside the unlocking zone. Design of door restricting mechanism shall permit opening of car doors from outside of the elevator car without the use of special tools. Only mechanical type door restrictors are permitted.

2.6 OPERATIONAL FIXTURES

A. Car Control Station: A car control station shall be applied to the front return panel of the elevator car or integral with the swing return. The panel or swing return shall be provided with a concealed, heavy-duty hinge to swing the panel open for maintenance and inspection access.

1. The car control station panel shall contain a bank of mechanical illuminated buttons and Braille marked to correspond to the landings served and contain an illuminated alarm bell, door open & close buttons, fireman's phase II service key & fixtures, key switches for lights, fan, and other controls required for specified car operation and control. Mount the panel at height to comply with accessibility standards. Floor buttons shall be positioned in a single column and fit within the code required range. Braille plates shall not be the same shape as the floor call buttons.

2. The car control station panel for each elevator shall incorporate the fireman's phase II key switch and associated fire operation fixtures inside a locked cabinet located at the upper portion of the panel. The fireman's keyswitch shall be of a tubular, 7 pin, style 137 construction and shall have a biting code of 6143521. The key shall be coded “FEO-K1.” The phase II key switch, instructions, call cancel button, fire jewel, door open and door close buttons, and stop switch shall all be located within this locked panel. The front of the cabinet shall be engraved with the label “FIREFIGHTERS' OPERATION”. The cover to the cabinet shall be openable with the same key that is used to operate the phase II key switch. This cabinet shall meet Elevator Code requirements.

3. The car capacity shall be permanently engraved on the lower portion of the car control station panel, or engraved on an inset panel at this location. Lettering shall not be less than 3/8 inch high and shall be black filled. The elevator number shall be permanently engraved at the top of the main car control station panel, or engraved on an inset panel at this location; lettering shall not be less than 1/2 inch high and shall be black filled.

4. Car control station shall not contain plastic or polycarbonate components, labels or frames.
5. The car control station shall also contain an integral speakerphone located at ADA/accessibility height requirements. Provide operating switches with manufacturer’s standard identification for required use or function. The activation button shall match the car operating panel button fixtures. The speaker shall be mounted behind the car operating panel with vandal resistant perforations drilled through the car operating panel and shall be as manufactured by Electronic Micro Systems, Inc., (854 Chester Road, Winston-Salem, NC, 27104, 1-800-333-3671).

   a. The speakerphone shall be of the automatic dialing type and shall have the capability to automatically identify its location upon receipt of the call to the party answering the call.

   b. Provide an activation button, with integral legend, and identification plate adjacent to the button. Illuminate button to indicate call registration. Provide means to cause indicator light to flash when call is answered. Provide engraved legend below indicator light explaining phone instruction. The speakerphone shall meet the requirements of ADA guidelines.

   c. Necessary shielded wires shall be provided by the contractor from the speakerphone in the elevator car, through the traveling cables, and shall terminate in a junction box on the elevator controller in the elevator machine room. Connections to the existing building service system shall be provided by the Contractor.

6. The car control station shall also contain a digital position indicator in the upper portion of the car control station panel.

7. The car operating panel shall also contain an applied card reader, furnished by others, installed by the contractor in this section. The card reader shall be located at ADA/accessibility height requirements.

8. The car control station panel shall also contain the Cart Loading button.

9. The car control station panel shall also contain emergency car lights and the emergency power unit employing a sealed rechargeable battery and static circuits, or a portion of the cab ceiling lights shall be made to work on a similar emergency power unit. The battery shall be 6-volt minimum, sealed, maintenance free, of either lead acid or gel cell construction, and designed to give a life expectancy of not less than 5 years. Illumination for the elevator car and power for alarm bell shall be provided in the event of power failure.

B. Car Position Indicator: A digital car position indicator with direction arrows shall be provided in the top of the car control station panel. The position of the car in the hoistway shall be shown by the illumination of the indication corresponding to the landing at which the car is stopped or passing. Provide an electronic, adjustable, floor bypass tone to indicate to passengers that car is stopping at a particular floor served.

C. Hall Push Button Station: A single riser of hall push button stations for the elevator shall be provided at each lobby. At each terminal landing, single type button fixtures shall contain the appropriate “Up” or “Down” buttons, and at each intermediate landing dual button type fixtures shall be provided, containing appropriate “Up” and “Down” buttons. All fixtures shall be installed at proper height to comply with the accessibility standards. The hall button fixture faceplates shall be the flat, applied type that is flush mounted with the wall. The hall buttons shall operate such that when a call is registered by any momentary pressure on the landing button, the button shall become illuminated and remain illuminated until the call is answered.

   1. The face plate of the Floor 1 hall button shall additionally contain the fireman's phase I key switch. The fireman’s keyswitch shall be of a tubular, 7 pin, style 137 construction and shall have a bitting code of 6143521. The key shall be coded “FEO-K1.” The fireman's phase I instructions shall be permanently engraved on the face plate or on an inset plate mechanically fastened flush with the face of the hall button fixture.

   2. The call buttons in the hall button fixture shall be centered at 42” above the finished floor.

   3. The hall button at the top landing shall contain the hoistway access key switch to activate Hoistway Access Operation.
D. Hall Lanterns: A hall lantern shall be mounted in the lobby wall above each hoistway entrance. The hall lanterns shall be the applied type with flush mounted face plates and shall be located horizontally above each respective elevator entrance. The lantern shall incorporate the appropriate triangular direction arrows for the up and down directions. The operating function of the hall lantern shall incorporate the appropriate directional tones per accessibility standards. An adjustable, electronic, audible tone shall sound to announce the arrival of the elevator car. The tone shall sound once for the "UP" direction and twice for the "DOWN" direction 4 seconds prior to the arrival of the car.

E. Fixtures: The hall lantern and position indicators shall be of the standard digital type. All other newly provided fixtures shall be of the vandal resistant type. All newly provided fixtures shall be constructed of stainless steel with a no. 4 satin grain finish. Vandal resistant screws shall be provided for mounting all signal and operational fixture face plates. Fixtures shall be as manufactured by the following or approved equal:

1. Otis M3 Vandal Resistant
2. ThyssenKrupp Panzer Moon with V2 Buttons
3. Innovation Bruiser Line
4. PTL Centurion Series

2.7 CAR ENCLOSURE

A. The elevator cab shall be a steel shell cab. The elevator cab side and rear walls shall consist of formed rigidized stainless steel panels, bolted together to form a complete steel shell cab. Cab shell panels shall be a maximum of 24” wide and made of a minimum of 16 gauge rigidized stainless steel (or, at Contractor’s option, provide 14 gauge rigidized stainless steel with a maximum panel width of 36”). Panels shall be provided with sound deadening exterior matting. Rigidized stainless steel shall have a 5WL pattern with a satin finish. The clear inside height of the cab shell shall be the manufacturer’s standard 8’-0” cab.

B. The front return panel shall incorporate an integral entrance column, shall be brushed stainless steel a minimum of 16 gauge, and shall extend from finished floor to underside of fascia. The strike jamb shall also be stainless steel a minimum of 16 gauge. The front return panel shall be arranged for mounting the car control station panel. A full width fascia of brushed stainless steel shall be furnished over the return panel and car entrance.

C. The car top shall consist of a panel which shall be clad with sheet metal and contain a hinged top emergency exit panel 17” x 24”, or code compliant equal. The car top material shall be 12-gauge furniture steel suitably reinforced with matte white painted finish.

1. Provide an interlock on the top of car emergency exit that will prevent operation of the elevator car if the exit cover is open more than 2”. Interlock shall be designed in accordance with code requirements.

2. A two-speed fan shall be mounted in the car top above the ceiling. Mount with rubber grommets and adjust for smooth, quiet operation. Fan shall be Morrison Model OE or approved equal.

3. A minimum of six (6) LED light fixtures shall be provided in the ceiling of the elevator car and shall be flush mounted with the car top interior. Light fixtures shall be the SOLOBEAM by Man-D-Tec or approved equipment. Fixture shall:

   a. Be provided with a retainer clip “hose clamp method” to keep fixture from rotating and secured to the cab ceiling.

   b. LED bulb shall be replaceable by use a special extraction tool to prevent patrons from removing the bulbs.

   c. Fixture shall be provided with a ventilated, protective housing on top of the cab strong enough for stepping upon by maintenance men and inspectors on the car top. Housing shall be set up by manufacturer with flexible conduit.
d. LED bulb shall have a 4100 K color temperature utilizing 4 watts per fixture with a dimmer located on the car top.

e. Fixture shall be UL listed.

f. The fixture closest to the car control station panel shall also double as the emergency car light fixture and be provided with an emergency power unit employing a sealed rechargeable battery and static circuits. The battery shall be 6-volt minimum, sealed, maintenance free, of either lead acid or gel cell construction, and designed to give a life expectancy of not less than 5 years. Illumination for the elevator car and power for alarm bell shall be provided in the event of power failure.

D. The car entrance shall be provided with three-speed, side-opening car doors with a brushed stainless steel facing on the car side suitably reinforced with applied hangers with track. Hangers shall be of the sheave type, two sheaves per door, rotating on a precision ball bearing. The roller shall be on an eccentric stud to provide adjustment. The door shall be of hollow metal construction. Car doors shall be provided with two phenolic gibbs per car door panel.

E. The platform shall be recessed below the car door sill to accept the car flooring so the flooring is flush with the car door sill upon completion of the installation. The car shall be provided with carpet tile flooring furnished and installed by the Contractor in this section. Carpet tile to be as specified in Division 9.

F. Solid stainless steel handrails and bumper rails shall be furnished on the sides and rear of the elevator cab and shall be mounted such that the top of the handrail is 36” above the finished floor and the top of the bumper rail is 12” above the finished floor. The handrail and bumper rails shall be approximately 3/8” by 6” square and the ends shall return back to the car walls.

G. The elevator cab shall be provided with protective stainless steel pad buttons permanently installed on the sides, rear, and front return panels. The contractor shall supply one (1) set of protective pads for the elevator upon substantial completion of the elevator work, pad color to be chosen from manufacturer's standards.

H. The car enclosure shall comply with the ASME A17.1 Safety Code for Elevators and Escalators. All stainless steel shall be provided with #4 brushed finish.

2.8 HOISTWAY ENTRANCES

<table>
<thead>
<tr>
<th>Hoistway Entrance Summary</th>
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<tbody>
<tr>
<td>Total Number</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Clear Opening</td>
</tr>
<tr>
<td>Door Panel Finish</td>
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<tr>
<td>Door Jamb Finish</td>
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</tbody>
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A. Frames: Stainless steel frames shall be of bolted construction for a one-piece unit assembly comprised of head and side jamb sections. All frames shall be securely fastened to sills and header and shall be a minimum of 16-gauge sheet material. The frames shall have the profile and depth to accommodate the wall system as shown on drawings.

B. Sills: Extruded aluminum sills shall be provided with non-slip wearing surfaces and grooves for door guides. Sills shall be supported on steel angles furnished and installed by the contractor in this section.

C. Fascia Plates: Fascia plates between floors shall be fastened to the header and sill above. All fascia to be galvanized or painted steel.

D. Toe guard: A toe guard shall be furnished at the lowest landing. Toe guard to be galvanized or painted steel.

E. Dust Cover: A dust cover shall be furnished at the highest landing. Dust cover to be galvanized or painted steel.
F. Headers: Headers of sufficient size and thickness to provide support for the frame and hangers shall be securely fastened to the strut angles and shall include integral hangers.

G. Struts: Strut angles shall be of sufficient size to support the entrance and shall be securely fastened to the building structure.

H. Hangers: Hangers shall be of the sheave type, two sheaves per door, rotating on a precision ball bearing shall be provided. The roller shall be on an eccentric stud to provide adjustment. Hangers shall be applied or integral on the top of the doors. Hanger fascia dust covers shall be provided over all hangers and shall be galvanized or painted steel.

I. Closers: Provide closers on all hoistway entrances and adjust to automatically close the hoistway doors when the car is away from the landing per Elevator Code requirements.

J. Doors: Provide steel hollow metal doors of the size and type indicated in elevator schedule, fabricated from steel sheet material with vertical internal channel reinforcements spaced at not more than 6" on centers and welded to face sheets. Panels shall be provided with a stainless steel on the lobby side. Bottom of doors shall be provided with two (2) removable phenolic guides per door panel, which run in the sill slots with minimum clearance. The door panels shall be furnished with barrel type, naturally finished, escutcheon plates for the door unlocking devices at each landing.

1. Hoistway doors shall be manufactured in accordance with the procedure established by Underwriters Laboratories and shall be so labeled. Four-inch decals indicating floor identification shall be applied on the hoistway side of the hoistway door panels.

2. Steel sight guards shall be furnished on the leading edge of the doors to conceal the hoistway beyond the doors. Finish to match door panels.

K. Handicap Jamb Markings: Provide stainless steel jamb marking plates with raised floor markings, a black background, and braille to identify each landing on both jambs of each hoistway entrance. Jamb marking plates shall be mechanically fastened to the entrance jambs utilizing stainless steel drive pins in the four corners of the plates.

L. Elevator Identification Signs: Provide a 3 inch high elevator identification number in the upper portion of the entrance frame at the main fire access floor as required by Elevator Code. Elevator number shall be mounted on the upper portion of the hoistway door jamb, opposite jamb of the hall button fixture, with the top of the plate approximately 1 inch from the top of the jamb and centered on the width of the door jamb.

M. Fire Evacuation Signs: Provide applied fire evacuation signs incorporating a pictograph as depicted in appendix H of the Elevator Code and mount above each hall button in the elevator lobbies. Signs shall be stainless steel.

N. All stainless steel shall be provided with #4 brushed finish unless stated otherwise.

PART 3 EXECUTION

3.1 PREPARATIONS

A. Site Inspection: Examine elevator areas, with installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of elevator work. Examine hoistway, hoistway openings, pit, and machine room as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ELEVATOR SYSTEM

A. General: Comply with manufacturer’s instructions and recommendations for work required during installation, referenced codes, and specifications.
B. Welded Construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Coordination: Coordinate elevator work with other sections for proper time and sequence to avoid construction delays. The contractor shall provide fully operational elevator system as stipulated in the construction schedule.

D. Sound Isolation: Mount rotating and vibrating elevator equipment and components on vibration absorption mounts, designed to effectively prevent transmission of vibrations to structure, and thereby eliminate sources of structure borne noise from elevator system.

E. Well For Cylinder: Drill required well hole; remove excess excavated material from the site, and install a steel casing. Additionally case the cylinder in capped, water-tight, PVC pipe, at least 1" larger in diameter than cylinder. The area between the steel casing and the PVC inner casing shall be back filled with clean, washed sand. Construct a PVC flange to create a water-tight seal between the PVC casing and the cylinder flange in the hoistway pit. Provide a means of testing the bottom seal and a means of evacuating any material that may enter the containment. The access risers should be capped to prevent water from entering the cavity should flooding occur in the hoistway pit.

1. Base bid shall include drilling hole in dirt, sand, rock, gravel, loam, boulders, hardpan, water, or other obstacles. Include the removal of all dirt and debris from the project site.

F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing. Set sills flush with finished floor surface at landings. Fill space under sills solidly with non-shrink, non-metalic grout.

G. Guide Rails: The guide rails shall be adaptable to contractor's equipment, erected plumb, properly aligned, and anchored securely to the existing structure.

H. Hoisting: All required hoisting and movement of the elevator equipment shall be the responsibility of the contractor in this section.

I. Jack Unit Packing: Upon completion of the construction, and prior to final acceptance, the jack packing on each cylinder head shall be replaced with new.

J. Final Cleaning & Painting: Upon completion of all elevator work, provide total clean down of elevator equipment. All steel components in machine room and hoistway shall be provided with touch up painting to remove all scratches and blemishes incurred during construction.

3.3 ELECTRIC WIRING

A. Conductors: Copper throughout with individual wires coded and all connections on identified studs or terminal blocks. Use no splices or similar connections on any wiring except at terminal blocks, control cabinets, junction boxes or conduits. Provide 10% spare conductors throughout.

B. Conduit: Painted or galvanized steel or aluminum conduit and duct shall be used. Conduit size shall be 1/2" minimum, except that 3/8" can be used for runs containing only 2 wires. Flexible conduit exceeding 18" in length shall not be used. Flexible heavy-duty service cord, type SO, may be used between fixed car wiring and car door switches for safety edges.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing: Upon nominal completion of the elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as depicted in Rule 8.10.3, "Acceptance Inspection and Tests of Passenger & Freight Hydraulic Elevators", of the Elevator Code. Also perform other tests, if any, as required by governing regulations.
B. Contractor is responsible for coordinating observance of final acceptance inspection with the Owner’s representative and a representative of Kenneth H. Lemp Elevator Consultant, Inc., as they have been retained by the University to represent the State of Missouri as the Licensed Elevator Inspector. Contractor is also responsible for coordinating any additional inspectors as required by local jurisdiction.

3.5 INSTRUCTION AND MAINTENANCE

A. A maximum period of four hours shall be dedicated to instruct Owner’s personnel in proper use, operation and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner’s personnel in normal procedures to be followed in checking for sources of operational failures or malfunctions.

B. Diagnostic Testing: The diagnostic testing device, or maintenance terminal, provided shall be demonstrated and tested during the final testing of the elevator installation. This diagnostic tool shall have the capability of troubleshooting and field programmability of all control variables providing interaction between the service man and the microprocessor controller including performance of all ongoing safety testing as required by ASME A17.1 elevator code.

3.6 PROTECTION

A. Temporary Use: Comply with the following requirements for each elevator used for construction purposes.

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.

2. Provide strippable protective film on entrance and car doors and frames.

3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.

4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.

5. Engage elevator installer to provide full maintenance service for elevators used for construction purposes. Include preventative maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Use parts and supplies as used in the manufacture and installation of original equipment.

6. Engage elevator installer to restore damaged work, if any, so that no evidence remains of corrective work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

B. At the time of substantial completion of elevator work (or portion thereof) provide suitable protective covering, barriers, devices, signs, or such other methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.7 ELEVATOR SCHEDULE

A. Furnish and Install One (1) Holed Hydraulic Service Elevator No. 1

B. Type of Machine Hydraulic Power Drive Machine (dry type) with Direct Holed Plunger/Cylinder Type Lift and Oil Cooler.

C. Load (Capacity) 6000 lbs.

D. Car Speed 125 Feet Per Minute
E. Drive
   A.C. Motor Drive with Reduced Starting Current and Automatic Two Way Leveling

F. Operation
   Simplex Collective Operation with:
   Fireman's Emergency Service
   Independent Service
   Cart Loading Button
   Card Reader Controlled Access

G. Seismic
   Zone 0

H. Approximate Travel
   45'-0"

I. Number of Stops
   Four (4) All at Front of Hoistway, at Floors 1, 2, 3 & 4.

J. Opening Size
   5'-6" W by 7'-0" H

K. Type of Car & Hoistway Entrance
   Side Opening, Three Speed

L. Door Operation
   Automatic Closed-Loop

M. Car Enclosure
   As Specified.

N. Car Structure
   Designed and equipped for future traction elevator application.

O. Minimum Car Inside Dimensions
   6'-4" wide by 8'-6" deep

P. Signal Fixtures
   1. Car Control Panel
      Provide a single car control station in the front return panel with integral phone, car position indicator and emergency car light.
      Provide one riser of hall buttons.
      Provide a hall lantern with electronic, adjustable directional tones above each entrance.

   2. Hall Buttons
   3. Hall Lanterns

Q. New Installation Maintenance
   Twelve (12) Months

END OF SECTION