Smithsonian Institution

Office of Planning, Design & Construction

SPECIFICATIONS

PROJECT NO.: 2030101

PROJECT TITLE: MSC: Replace Pod 5 Roof

FACILITY: MSC
4210 SilverHill Road
Suitland, MD 20560

DATE: March 15, 2023

This project is approved as being in conformance with applicable provisions of the Smithsonian Directive (SD) 410.

Michael J. Carrancho, P.E., Deputy Director — Date 4/24/23

600 Maryland Avenue, S.W.
Suite 5001
Washington, D.C. 20024
Voice: 202.633.6230 Fax: 202.633.6233

USPS Mail: OPDC Capital Gallery
MRC 511
P.O. Box 37012
Washington, D.C. 20013-7012

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PROJECT SUMMARY AND INFORMATION

1. PROJECT INFORMATION

1.1. OFEO Project No. 2130101
MSC Replace Pod 5
4210 Silver Hill Road
Suitland, MD 20746

1.2. Smithsonian Institution Contacts:

Contracting Officer (CO), address for Fed Ex and UPS delivery:
Smithsonian Institution
Office of Contracting and Personal Property Management
600 Maryland Ave. SW
Suite 500E
Washington, DC 20024

Contracting Officer (CO), address for USPS delivery:
Smithsonian Institution
Office of Contracting and Personal Property Management
MRC 1200
P.O. Box 37012
Washington, DC 20013-7012

Contracting Officer's Technical Representative (COTR), address for delivery:

Smithsonian Institution
Attn: Stephanie Stefanik, COTR
Office of Planning, Design & Construction
4210 Silver Hill Road
Suitland, MD 20746

2. SUMMARY OF WORK

2.1. Furnish all supervision, labor, materials and equipment needed to Remove the existing Roof assembly and provide a new roof assembly at the Smithsonian Institution's

Museum Support Center located at 4210 Silver Hill Road, Suitland, MD 20560, as set forth on the Drawings for OFEO Project No. 2030101, sheets l through 12 and in these specifications, both dated March 15, 2023.

2.2. The Work includes, but is not limited to:

- Remove existing roof assembly and provide new roof assembly, including all flashing and accessories.
- Provide new roof hatch.
- Remove and reinstall fall protection system
- Remove/relocate/reinstall lighting protection system. Keep system operational throughout the Project. Have system inspected and recertified at the conclusion of the project.

2.3. Critical Elements of the Work: The successful Contractor shall be fully qualified to install critical elements of the Work. Bidders/offerors shall submit a statement of qualifications to address the following critical elements of the Work:

Roofing with the specified roof type.

3. CONTRACT TIME FOR COMPLETION

3.1. Work under this contract shall begin by the Contractor within ten (10) calendar days after the Notice to Proceed and shall be completed within the total contract time of 180 calendar days. All work, including project closeout activities, shall be completed in every respect within the contract time.

3.2. The start date and completion date shall be as stated in the Notice to Proceed issued by the Contracting Officer.

4. SCHEDULE OF OPTIONS FOR *BID/PROPOSAL – NOT USED

5. SCHEDULE OF UNIT PRICES – NOT USED

6. BIDDER EXAMINATION OF SITE

6.1. Every effort has been made to indicate all work necessary to complete the project as identified. All bidders shall carefully examine the premises during the bid period and satisfy themselves as to the extent, nature and location of the work, general and local conditions, particularly those bearing on transportation, disposal, handling and storage of materials, availability of labor, water, electric power, access routes, uncertainties of the

weather, type of equipment and facilities needed for the successful execution of the Work.

6.2. Pre-Bid Conference and Site Visit. Before the bid opening date, a scheduled pre-bid conference and site visit will be announced by the Contracting Officer. The purpose of the scheduled meeting is to provide an opportunity for all bidders to review the project site. Any comments, information or discussion during the site visit shall not modify the Contract Documents.

5. This project requires special arrangements for access to a non-public area. Access to the site will be restricted at times other than during the scheduled visit.

7. AVAILABILITY OF DOCUMENTS

7.1. The bidder may obtain a compact disc with electronic versions of the drawings and specifications from:

Smithsonian Institution
Office of Planning, Design and Construction
600 Maryland Avenue, SW
Suite 5001
Washington, DC 20024

SPECIAL PROJECT REQUIREMENTS

8. UNITS OF MEASURE

8.1. All fabrication and installation shall be performed in accordance with the units of measure given in the Contract Documents.

8.2. All Contractor and subcontractor personnel working on the site shall possess and use metric measuring equipment for all work shown in metric units. Conversion of dimensions shown on Contract Drawings to English units for use of non-metric measuring equipment is prohibited.

9. NON-PUBLIC, TENANT AND SECURED SPACES

9.1. Certain tenant spaces, non-public spaces, utility and equipment rooms and other areas related to or used for purposes of storage, conservation, research, curation of museum collection and artifacts or for scientific research may have restricted access.

9.2. Identify to the COTR as soon as possible, but no less than two (2) working days in advance, any occupied areas that the Contractor must access that are located outside the limits of the project site. Identify in writing:

9.2.1. Restricted areas to be accessed.

9.2.2. Specific reason for needing access.

9.2.3. Nature of the work to be performed.

9.2.4. Date(s) and hours needed to complete construction work activity.

The COTR will have and OPS officer and a collections staff representative present.

10. MUSEUM ARTIFACTS AND SCIENTIFIC RESEARCH MATERIALS

10.1. The handling of museum artifacts or scientific research experiments by the Contractor is strictly prohibited without written consent of the Smithsonian. The existing museum artifacts and research related materials may be moved only by authorized Smithsonian Museum curatorial personnel. An offender of this clause may be subject to arrest or removal from the premises and project by Smithsonian security officers.

10.2. If temporary relocation of artifacts or research experiments is necessary, give notice to the COTR at least five (5) working days in advance of the time relocation is needed.

10.3. Humidity/Temperature Controlled Spaces: Take care to minimize fluctuations in air conditions and quality, particularly in areas containing artifacts and storage collections and laboratories and scientific research experiments. Humidity and temperature-controlled areas require consistency of utility operation.

11. PROTECTION OF HISTORIC PROPERTIES – NOT USED

12. COMMITMENT TO SUSTAINABILITY

12.1. The Smithsonian Institution is a trust instrumentality of the United States (recognized as a tax-exempt organization under Section 501(c)(3) of the Internal Revenue Code) and although not an Executive Branch of the U.S. Government, is committed to planning, designing, constructing, maintaining and operating its owned and leased buildings and facilities consistent with Federal environmental and energy management requirements, as listed in the Smithsonian OFEO Codes, Standards and Guidelines document, dated October 2021, to the maximum extent practical.

12.2. Refer to MasterSpec (AIA) Division 01 sections following this section 010000 on Sustainable Design Requirements - LEED, General Commissioning Requirements, Construction Waste Management and Disposal and other related sections, as required.

13. **COMMISSIONING – NOT USED**

CONTRACTOR USE OF PREMISES

14. HOURS OF WORK, WORKDAYS AND GOVERNMENT HOLIDAYS

14.. For each occasion the Contractor intends to work on Saturdays, Sundays or Smithsonian holidays or during hours other than those indicated above, obtain written permission from the COTR, at least three (3) working days in advance.

14.4. Reimburse the Smithsonian Institution for security and inspection services provided by the Smithsonian when the Contractor chooses to work outside the normal workdays and hours, as identified herein. However, the Contractor will not be charged for SI overtime security and inspection services, if in the opinion of the COTR, the work cannot be done during the normal workdays and hours due to requirements of the Smithsonian.

14.5. Smithsonian Holidays: For holidays that fall on Saturday, the Smithsonian Holiday is observed on the previous Friday. For holidays that fall on Sunday, the Smithsonian holiday is observed on the following Monday. The Smithsonian Holidays are listed below.

New Year's Day	January 1
Martin Luther King Jr.'s Birthday	January, third Monday
George Washington's Birthday	February, third Monday
Memorial Day	May, last Monday
Juneteenth	June 19th
Independence Day	July 4
Labor Day	September, first Monday
Columbus Day	October, second Monday
Veterans' Day	November 11
Thanksgiving Day	November, fourth Thursday
Christmas Day	December 25
President's Inauguration Day	January 20, 2024

15. CONDITIONS AFFECTING CONTRACTOR'S WORK

15.1. Existing Occupied Spaces: The premises will be occupied during the performance of the Work. Schedule work activities to minimize interruption of occupants and occupied spaces.

15.3. Space for Contractor Use: The space available for Contractor's use is limited to areas indicated on the Contract Drawings as the project site. Space allocation and availability are subject to change, at the discretion of the Smithsonian, to meet the needs of all parties requiring access and space within the building and the surrounding areas.

16. CONTRACTOR DELIVERIES, HAULING AND ACCESS

16.1. The Contractor's materials and equipment shall be delivered, received and handled by the Contractor's personnel.

16.2. Access to the building for on- and off-loading of all material, structures and equipment is at the Contractor’s staging areas. Contractor will not have regular access to the building’s loading dock.

16.3. The Contractor must provide exterior means of building roof level access for personnel, equipment and materials. The Contractor is prohibited from using interior spaces, stairs or elevators for movement of personnel, material, structures and equipment.

16.3.1 Allow the COTR and others approved by the COTR to use the Contractor’s stairs and scaffolds for access to the roof to observe the progress of the work.

16.4. The transportation of hazardous materials or hazardous waste must be performed on building exterior only. Transport all hazardous materials in secondary containment and properly secured to transport carts to prevent breakage or spills.
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17. DRESS AND DEPORTMENT

17.1. Contractors' personnel shall be fully and appropriately clothed at all times and shall conduct themselves in a manner appropriate to a public place. The COTR may require removal of any individual from the premises and project for unacceptable dress, demeanor or disruptive conduct, if the Contractor superintendent fails to correct conditions in violation of this paragraph.

18. CONTRACTOR PARKING

18.1. Parking will be available on-site. The COTR will indicate areas of existing paved lots available for contractor parking. Parking may require display of permits issued by the COTR.

19. EATING, DRINKING, SMOKING AND ILLEGAL SUBSTANCE ABUSE

19.1. Eating and drinking in Smithsonian buildings or leased space will be allowed only in designated areas. Offenders may be subject to removal from the premises and project should the Contractor's Superintendent fail to correct conditions, which, in the opinion of the COTR, violate this clause.

19.2. The consumption of alcoholic beverages by the Contractor's personnel is prohibited in all Smithsonian buildings or leased space.

19.3. Smoking or carrying lighted tobacco products is prohibited in all Smithsonian buildings or leased space, in exhibition and public spaces, in areas where hazardous materials are stored or handled and in areas undergoing construction, renovation or repair. Acceptable areas for smoking are outside of the building at least twenty-five (25) feet from any opening, operable window or air intake vent and as designated by the COTR.

19.4. The possession, sale and/or use of narcotics or other illegal substances or firearms by Contractor employees are strictly prohibited in all Smithsonian facilities and leased space. Contractor employees are strictly prohibited from working on the project under the influence of alcohol and/or illegal substances. Contractor employees in violation of any of the above prohibitions will be removed from the project.

PROJECT COORDINATION

20. COORDINATION OF TRADES

20.1. Coordinate work of different trades so that interference between mechanical, electrical, architectural and structural work, including existing services, shall be avoided.

20.3 Where work by separate entities requires off-site fabrication of products and accurate interfacing of materials to produce the required results prepare coordination drawings to indicate how work shown on separate shop drawings will be interfaced, intermeshed and sequenced for installation. Coordination drawings shall be submitted in accordance with the requirements of the "Submissions" section.

20.3.1. Work installed prior to approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Smithsonian. If an interference develops, the COTR will decide which work shall be relocated, regardless of which was installed first.

20.4. Installation of equipment and systems shall allow the maximum practical space for operation, repair, removal and testing, within the limits indicated on the Contract Documents. Reinstall any temporarily removed pipes, conduit, lightning protection grounding, and other system components in their original configuration, unless directed otherwise in the Contract Documents.

21. QUALITY CONTROL

21.1. Provide for quality control, inspections, testing and re-testing as necessary for all work, including that of Subcontractors, to assure compliance with the Contract Documents.

21.2. Assign a qualified person to act as the Contractor’s Quality Control Officer to coordinate testing and inspections. This person may be the Contractor’s Superintendent or another qualified person approved by the COTR that is onsite daily during the work.

22. PERMITS, LICENSES& FEES

22.1. The Contractor shall obtain and pay for all applicable permits and licenses required by regulating agencies, including but not limited to: permits for pedestrian and road markings, construction fences, sidewalk cuts, utility company connections, elevator certificates, waste containers, etc.

22.2. The Contractor shall pay all duties, fees, taxes and other charges and give all notices necessary and incidental to the due and lawful execution of the work.

22.3. The Contractor shall keep the Smithsonian indemnified against all penalties and liability for breach of provisions of any national, provincial, district or city statute, ordinance or law and the regulations and by-laws of any local or other duly constituted authority, which may be applicable to the Work and with such rules and regulations of public bodies and companies.

23. UTILITY SERVICE INTERRUPTIONS AND NEW CONNECTIONS

23.1. Any planned interruption in utility service must be approved by and coordinated through the COTR. Submit a written request as far in advance of scheduled interruption as possible, but no less than two (2) full working days in advance. Make the necessary temporary provisions to supply continuous electrical power, HVAC space conditioning and security as required during periods when service is interrupted.

23.2. The Contractor's work efforts to restore service shall be continuous until the interrupted utility is back in service.

23.3. he electrical power for MSC may not be interrupted.

24. SMITHSONIAN-FURNISHED ITEMS INSTALLED BY THE CONTRACTOR – NOT USED

25. SALVAGE – NOT USED

26. CUTTING, PATCHING AND MATCHING EXISTING WORK

26.1. Existing work shall be cut, drilled, altered, removed or temporarily removed and replaced as necessary for performance of work under the contract. Work that is replaced shall match similar existing work. Structural members shall not be cut or altered, except where noted on drawings, without authorization of the COTR. Work to remain in place, which is damaged or defaced during this contract shall be restored to match the conditions existing at the time of award of the contract, at no additional cost to the Smithsonian.

26.2. Conditions exposed by removal of existing work that do not match new finishes or align with new work shall be called to the COTR's immediate attention. Necessary corrective work directed by the COTR will be subject to adjustment provisions as stated in the General Conditions of the contract.

PROTECTION OF THE SITE DURING CONSTRUCTION

27. PROTECTION OF THE SITE

27.1. Provide adequate protection for all parts of the building, including interior and exterior surfaces, its occupants and contents and grounds wherever work under this contract is performed.

27.2. Plan for Protection of the Site: Submit a plan for protection of the site to the COTR for approval. As a minimum, the Plan shall describe:

27.2.1. Proposed method, location and construction of temporary enclosures.

27.2.2. Routes of access and egress, including those for people with disabilities.

27.2.3. Location and maintenance of emergency exits.

27.2.4. Methods of protection of existing surfaces and occupants.

27.2.5. Means of connection of temporary enclosures.

27.2.6 Means, Methods and Monitoring to assure the work does not generate shock/vibrations that might be transferred to the collection storage area below the roof.

27.3. Erosion and Sedimentation Control (ESC) Plan: - NOT USED.

27.4. During construction, temporary enclosures shall be constructed to prevent unauthorized access or egress. Dust and fume barriers shall be constructed, as needed or as determined by the COTR, to seal and isolate the work area from the remainder of the interior areas while the work is in progress. Wood used for protection of the site shall be pressure-impregnated, fire-retardant. All plastic sheeting shall be fire retardant 6-mil polyethylene. Submit product data to the COTR for review and approval.

27.5. Submit information describing the proposed construction of temporary enclosures and methods of installation to the COTR for approval. Any connections to existing structures must be accomplished in such a way as to minimize disturbance of existing surfaces.

28. PROTECTION OF FLORA, AND CENTRAL COMPUTER CONTROLLER IRRIGATION SYSTEM

28.1. Flora Protection: The Contractor is expressly prohibited from collecting plant materials on Smithsonian property.

28.2. Do not store materials inside the drip-line of trees or shrubs. Prior to the start of the work on site, surround trees within the project site and adjacent areas with a protective fence ("snow fence"), 1.4 m high (minimum), 300 mm outside the drip line (minimum). The protective fencing shall be constructed of heavy-duty metal posts or pressure-treated 100 mm X 100 mm wooden posts, 1 m on center, with a top and bottom stringer of 50 mm X 100 mm members. The fencing fabric shall consist of 40 mm X 13 mm slats, pressure-treated.

28.3. Vehicular traffic inside the drip-line of trees, on turf areas or on flowerbeds is not permitted without prior approval of the Smithsonian Gardens through the COTR. If flowerbeds must be crossed by vehicles, bridging is required. Bridging shall be 2 layers of ¾ inch exterior grade plywood or 2" x 10" or 1" protective plastic decking such as Bravo mat or equal to help prevent soil compaction of the soil in the lawn areas and flowerbeds. No parking on the turf will be permitted at any time.

28.4. Where aerial work is being performed above flower/shrub beds, protect them with an approved protective framework installed at least 300 mm above the tops of the plant materials. Submit the proposed method of protection to the COTR and Smithsonian Gardens for approval. Trees and shrubs shall only be tied back with the approval of the COTR and Smithsonian Gardens.

28.5. Any damage to the existing irrigation systems during construction shall be repaired by the Contractor within two calendar days from when the damage occurred. All repairs to the irrigation system shall be made by a certified irrigation contractor to work on Rain Bird Maxicom computer-controlled irrigation systems. Certification is required.

28.6. Damaged piping shall be replaced using approved materials per section Division Two, "Site Work, Irrigation Systems."

28.7. Bear all costs for repairs to the damaged irrigation system. Where the low voltage control wiring is damaged due to construction, then said wiring shall be replaced from the zone valve to controller. No splicing will be permitted.

28.8. Identification tape, when damaged, shall be replaced with an identification wire from valve to controller.

28.9. All damaged irrigation piping shall be cleared of debris prior to making the permit connections.

28.10. Bear all costs for replacement of damaged plant materials. Replacement plant materials shall meet the criteria established by the Smithsonian Gardens Division of the Office of Facilities Management and Reliability.

28.11. Plant material removed by the Contractor for reuse shall be balled, bagged and protected in accordance with instructions prepared by the Smithsonian Gardens.

28.12. Turf areas damaged during construction shall be repaired by the Contractor by rototilling a minimum depth of 6 inches, backfilled with sandy-loam topsoil. Sod shall be certified sod, none netted and a minimum of one year old. Sod shall be 90:10, consisting

of a minimum of three varieties tall fescues and one Kentucky Bluegrass. Smithsonian Gardens, through the COTR, must approve the source of the sod. Bear all costs for these repairs. Suggested sources are:

Oakwood Sod Farm, Inc.
29307 Waller Road
Delmar, MD 21875
Phone: (410) 896-4009
Toll-Free: (800)379-8488

Collins Wharf Sod
25361 Collins Wharf Rd
Eden, MD 21822
Phone: 410-334-6676
Fax: 410-749-3815
cwsod@collinswharfsod.com

Summit Hall Sod Farm
21300 River Road
Poolesville, MD 20837-9114
Phone: 301-948-2900
Fax: 301-349-2668

28.13. Be responsible for the daily removal of trash and construction debris from turf and flower/shrub beds within the limits of construction.

28.14. Any plant material destroyed and/or damaged by the Contractor during construction shall be replaced with like genus and species of the same size, at no additional cost to the Smithsonian. The damaged plant materials must be replaced prior to final payment. The same applies to artifacts or furniture collection pieces. Smithsonian Gardens requires five (5) working days notice should any of the artifacts or furniture collection need to be removed to facilitate construction.

28.15. Any construction scaffolding on turf and planted beds must be coordinated with the Smithsonian Gardens through the COTR to ensure that its installation will not damage or destroy existing plant materials or turf area or interfere with daily maintenance of the grounds. Trees may be tied back to permit scaffolding erection, no more than 4 feet if possible. The tying back must be performed by a certified Arborist with the approval of Smithsonian Gardens and the COTR. Where scaffolding is necessary to facilitate construction, Smithsonian Gardens requires a three (3) workday notice for said work.

28.16. Due to structural weight limits, vehicular traffic is permitted inside the Smithsonian's Enid A. Haupt Garden only with prior approval by the COTR and Smithsonian Gardens.SI analysis assumes that a contractor will not physically disturb the existing waterproofing system for the facility and that large amounts of soils or stone not be plied up on the structure, in addition to the vehicle weights. The allowable live load on the existing structure is 100 pounds per square foot. The following load values should not be exceeded without prior SI review:

28.16.1. The first is the Gross Axle Weight Rating (GAWR) of 9,000. pounds. This is the maximum allotted load on one vehicle axle or piece of equipment axle. This includes summation of the vehicle or equipment weight, the load carried and personnel on the individual axle.

28.16.2. The second is the Gross Vehicle Weight Rating (GVWR) of 14,000. pounds. This is the maximum allotted overall vehicle weight or equipment weight that includes the summation of the total vehicle or equipment weight, the total amount of material carried and personnel weights.

28.16.3. The following is a list of common equipment models, which embody the maximum sizes of vehicle or equipment conforming to the weight ratings above:

a. Deere Landscape Loader 210LJ
b. Deere Tractor J165M
c. Caterpillar Compact Wheel Loader 906H
d. Ford Truck F350
e. Ford Truck F450

28.16.4. Before either of the two listed load values (GAWR or GVWR) is exceeded by a truck or piece of equipment, the Office of Planning, Design and Construction(OPDC)shall be contacted for review. All cranes or lifts must also be reviewed by OPDC before using them in the area.

28.17. If a generator is placed on the turf, SG must have approval of its placement. Generator shall be placed on anti-compactor boards. The generator must be placed in a drip containment basin.

28.18. A schedule of values for plant material is not required.

28.19. Topsoil: ASTM D 5268, fertile, naturally sandy loam as defined by USDA Handbook no. 18, Figure 38. It shall be natural, surface soil in a friable condition and contain less than 3% subsoil. The topsoil shall be free of hardpan material, stones and

clods larger than ½ inch in diameter, sticks, tree or shrub roots, debris, toxic substances (e.g. Residual herbicides) and other material detrimental to plant growth. The area and the topsoil shall be free of plant or plant parts of undesirable plants such as, but not limited to, Bermuda grass, nut sedge, mugwort, Johnsongrass, Quackgrass, Canada Thistle or noxious weeds as set forth in the Federal Seed Act. It shall be certified free of Southern Blight.

28.19.1 Contractor shall notify COTR of location of all sources of the topsoil and furnish the COTR a certified report from the agricultural experiment station or approved agricultural laboratory of an analysis performed not more than 60 days prior to the date of submission. The topsoil shall be certified to meet the following requirements:

a. Shall be a natural, original surface soil of a sandy loam texture with a mechanical analysis of 60-65% sand, 15-25% silt and 10-15% clay.

b. Shall have at least 2%, but not more than 5%, organic matter.

c. Soil pH shall be 5.5 to pH 6.5 inclusive unless otherwise specified.

d. Soil salinity by electrical conductivity measurement shall not exceed 600 parts per million (ppm) as determined by Black, Editor "Method of Soil Analysis," Part 2, published by the American Society of Agronomy, 1965.

e. The soil nutrient level shall be greater than 100 lbs./acre of magnesium, 150 lbs./acre of phosphorous and 120 lbs./acre of potassium.

28.19.2. Agricultural limestone at not more than 5 pounds per cubic yard of top soil may be used to adjust an acidic condition provided it is well mixed in a manner, which does not destroy the structure of the soil.

28.19.3. Topsoil that has been synthesized by blending materials which individually do not meet the requirements of this specification will not be accepted even though the resulting blend meets the organic matter, mechanical analysis, pH and soluble salts requirements.

28.19.4. The COTR reserves the right to inspect and sample all topsoil at the source and at the time of delivery. These inspections will be made without cost to the Contractor.

28.19.5. Topsoil must not be delivered or handled in a frozen or muddy condition.

28.19.6. Shipment and Delivery - All soil must be approved by the COTR before delivery to the site. Any material not meeting requirements of this specification will be rejected on or after delivery.

DEBRIS CONTROL AND DAILY CLEANUP

29.1. Regularly clean up the work areas and shall, at all times, maintain the project in as neat and orderly a manner as is consistent with normal operations. Debris resulting from construction operations shall be removed from the site daily by the Contractor. Keep all access, haul routes and site areas free of dirt, debris and other materials resulting from construction activities.

29.2. Under no circumstances shall any rubbish or waste be dropped or thrown from one level of scaffolding to another or within or outside the building. Rubbish may be lowered by way of chutes, taken down on hoists or lowered in receptacles.

29.3. Trash receptacles: Provide enclosed trash receptacle(s) in quantity and size necessary to meet project needs, located as approved by the COTR.

30. DUST AND AIR QUALITY CONTROL

30.1. The Contractor will execute the Work by methods that minimize dust, vapors and gases raised by construction operations. The Contractor will utilize engineering controls and work practices to prevent airborne dust, vapors, gases and objectionable odors from dispersing into the atmosphere and from being drawn into existing air-intake louvers, ductwork, adjacent elevator shafts, loading dock doors, and/or other openings. A work plan of methods and means for this section shall be submitted to the COTR for review and approval.

30.2. Dust barriers shall be erected, where necessary, to protect adjacent areas from dust infiltration as required by the COTR. Dust barriers shall be rigid and visually opaque and shall seal the work area by affixing to the structure on all sides (i.e. ceiling, walls and floor). Wood used for dust barriers shall be pressure-impregnated, fire-retardant treated lumber. All plastic sheeting shall be fire-retardant 6-mil polyethylene. Submit product data for review and approval to the COTR.

30.3. Means of connection of dust barriers to existing structures shall not damage the building fabric. Details of barriers shall be submitted for approval to the COTR.

30.4. No open fires or burning of trash are permitted.

31. NOISE CONTROL

31.1. Comply with the regulations of OSHA Standards 1926.52 and 1910.95 and all other regulations relative to safety noise control.

31.2. Activities that generate excessive noise or vibration and interrupt museum functions or create public disturbances may be required to be performed during off-hours at the discretion of the COTR.

31.3. Provide sound attenuation to maintain acoustic level below 75 dBA at a distance of 15 m or below 75 dBA in occupied staff areas if less than 15 m away from noise source.

32. VERMIN, PEST AND RODENT CONTROL – NOT USED

33. DRILLING, WELDING AND TORCH CUTTING

33.1. Daily Permits: When welding, torch cutting or other heating operations are to occur inside existing structures, the Contractor shall obtain a daily HOT WORK PERMIT from the from the COTR/Construction Management Team. Permit must be obtained no more than 24 hours in advance, including for days following holidays, Mondays and off-hours (night) work. Reference attached Hot Work Permit form and General Instructions for required permit process. The permit must be posted at the job site prior to beginning the scheduled work. During the course of the Work, all existing smoke and heat detectors and sprinklers heads must remain operable. Coverings may be applied to protect them from spray coatings or other hazardous conditions only during the actual operations. Coverings must be removed immediately after the operations have concluded, but at the end of each working day at a minimum. When work produces dust or other airborne contaminants, e.g. spray painting, that could impair existing fire suppression or detection system(s) or when the system itself is otherwise impaired (drained down, etc.), the Contractor shall obtain a daily FIRE SYSTEM IMPAIRMENT PERMIT. Fire System Impairment Permit must be obtained a minimum of 48 hours in advance. Reference attached Fire System Impairment Permit form and General Instructions.

33.2. Fire Watch: No welding or torch cutting shall be performed unless adequate fire protection is provided. The Contractor shall maintain a fire watch for the duration of welding, cutting and heating operations and for at least 30 minutes after the 'hot' work has stopped. A fire extinguisher (minimum 10 pounds, dry-chemical type, typical) shall be on hand when drilling, welding or cutting.

33.3. Use of Impact Hammers: The use of impact hammers or other equipment causing vibration, noise and dust may be harmful to collections and/or building occupants. The Contractor shall request approval from the COTR at least five (5) working days before beginning this type of work to ensure adequate time for notification of building occupants and protection of objects and collections.

33.4 Ventilation: The Contractor shall provide adequate ventilation to prevent air contamination or the accumulation of toxic materials. Take necessary measures to prevent welding fumes from passive transfer to adjacent areas and from entering mechanical ventilation systems, including sealing all adjacent ducts and equipment openings with plastic. Where transfer is deemed likely or verified by the COTR, utilize local exhaust ventilation with HEPA filtration to control welding fumes. The Contractor shall submit means and methods for controlling air contamination to the COTR for review and approval.

TEMPORARY CONSTRUCTION FACILITIES

34. CONTRACTOR FIELD OFFICES, TRAILERS AND SHEDS

34.1. The Contractor shall establish a temporary office at the project site. The Contractor shall provide information about proposed locations of any temporary office, sheds, trailers and staging and storage areas and designation of size, color and materials to the COTR for approval at least five (5) working days prior to mobilization.

34.2. The Contractor may provide his own locking device on the door to the temporary office, trailer or shed. provide a key to the COTR for turn-over to the Office of Protection Services in case of emergency. The Contractor shall be solely responsible for the safekeeping and security of the construction facilities, materials and equipment.

34.3. Upon completion of the Work, the temporary offices, trailers and sheds shall be removed and the area returned to its original pre-contract condition.

35. STAGING, STORAGE AND WORK AREAS

35.1. The Contractor shall provide adequate storage and protection of materials and equipment delivered to the site to prevent theft, weather damage, mold infiltration, moisture damage and other physical damage.

35.2. Plan for Staging, Storage& Work Areas: The Contractor shall submit a drawing (scale not smaller than 1:500) of areas proposed for construction operations for approval by the COTR at least five (5) working days prior to mobilization or at the Preconstruction Meeting, whichever is first. The drawing shall show buildings, utilities, temporary toilet

facilities, temporary utility extensions, temporary interior walls and barriers to limit unauthorized intrusion and to control noise and dust, pedestrian walkways, vehicular access, temporary fencing, trailers, sheds, storage areas and the Contract's desired route for access and egress to the premises and to the project site.

35.3. All wood used for temporary, interior construction shall be pressure-impregnated with a "Dricon" treatment or an equal treatment approved by the Smithsonian Institution. All pieces must bear the UL "FR-S" stamp. Intumescent (fire-retardant) paint shall not be used. All plastic sheeting shall be fire retardant 6-mil polyethylene. Submit product data to the COTR for review and approval.

35.4. Fencing: The Contractor shall install a "snow fence" to define the temporary work limits for construction around exterior staging, storage and work areas at no additional cost to the Smithsonian. The snow fence shall consist of 40 mm x 13 mm slats, preservative treated, 1.2 m high with 12 gage wire and 50 mm spacing between slats, on 1.8 m steel pickets with 1.8 m on center spacing.

36. SANITARY FACILITIES

36.1. Contractors' personnel shall not be permitted to use the toilet rooms on the premises. The Contractor shall provide and maintain separate temporary sanitary facilities at locations approved by the COTR and shall remove the facilities at the completion of the work.

37. TEMPORARY UTILITY SERVICES AND EXTENSIONS - NOT USED

38. SCAFFOLDING AND PLATFORMS

38.1. The Contractor shall erect temporary scaffolding in accordance with OSHA 29 CFR 1926.451 and ANSI A10.8. The Contractor shall provide landing platforms with stairways or ladders for proper access and egress to all work areas.

38.2. For all frame scaffolding greater than 4 m in height, the Contractor shall submit working drawings to the COTR a minimum of ten (10) working days in advance of scaffolding erection. Working drawings submitted by the Contractor shall be certified by a registered Professional Engineer.

38.3. During non-working hours, the Contractor shall close and lock the scaffolding with a physical barrier to prevent access by unauthorized persons.

39. PROJECT SIGNS

39.1. All signs, including signs identifying the Contractors, shall be submitted at least five (5) working days prior to erection for approval by the COTR. The Contractor shall maintain and relocate the signs, as necessary, during the progress of the Work. The Contractor shall remove all signs, framing and foundations at the completion of the Work.

39.2. Construction Site Information and Direction: Informational signs required to indicate the location of the Contractor's office and directional signs for safety, vehicular control, pedestrian right-of-ways, detours to facilities, etc. shall be furnished and installed by the Contractor as requested and approved by the COTR.

MEETINGS

40. PRECONSTRUCTION MEETING

40.1. A Preconstruction Meeting will be scheduled with the Contractor before any work is started at the site. As soon as possible after the Date of Award, the COTR will contact the Contractor to arrange a time, date and place for the conference. Items to be discussed at the Preconstruction Meeting include, but are not limited to:

40.1.1. Contract Time: Notice to Proceed date and Completion date;

40.1.2. Scheduling and Submittals;

40.1.3. Mobilization and Staging;

40.1.4. Access to the Premises, Haul Routes, Loading Dock;

40.1.5. Contractor Deliveries;

40.1.6. Security Requirements/List of Contractor's Personnel;

40.1.7. Emergency Procedures and Phone Numbers;

40.1.8. Protection of Site and Historic Preservation;

40.1.9. Fire Protection and Safety Requirements;

40.1.10. Utility Interruptions, Rough-in Inspections, Testing;

40.1.11. Applications for Payment;

40.1.12. Pre-Condition Survey of the Site;

40.1.13. Accessibility Requirements;

40.1.14. Sustainability Requirements;

40.1.15. Building Systems Commissioning;

40.1.16. Quality Control;

40.2. The Contractor's key staff and representatives of all Subcontractors or Suppliers shall attend the Preconstruction Meeting.

40.3. Coordination Plan: The Contractor shall use the Preconstruction Meeting to develop a Coordination Plan for interaction with other parties working in or using the facility. The plan shall be submitted no less than five (5) working days after the Preconstruction Meeting and shall address interactions with other contractors, tenants, the public and any others making use of the site and surrounding areas. As a minimum it shall include:

40.3.1. Locations of overlap in use of the site by the Contractor and others, including work areas, delivery points, access/egress areas.

40.3.2. Specific items of work by others required to support critical milestones in the Contractor's schedule.

40.3.3. Coordination with the work of the designated Commissioning Provider.

40.3.4. Completion or delivery of work by others that may impact the Contractor's schedule.

40.3.5. Portions of the work that create special hazards or disturbances.

40.3.6. Portions of the work that affect utilities, fire-protection or detection systems or security systems.

40.3.7. Events requiring access to areas outside of the project site or secured spaces.

40.3.8. Protection to be provided by the Contractor for work completed by others either before or during this project.

41. PRE-CONDITION SURVEY OF THE SITE

41.1. After the Preconstruction Meeting and before the start of work on the site, the project site (i.e. building, its contents, grounds and equipment) shall be inspected by the Contractor, major Subcontractors, COTR and other Smithsonian Institution personnel as may be required for the purpose of verification of the existing conditions. Any damages or defective equipment will be noted at this time and this survey will serve as the basis

for the establishment of the pre-contract conditions. The identification of pre-contract conditions will be jointly established by the Contractor and Smithsonian Institution.

41.2. Written and photographic documentation: The Contractor shall prepare a typewritten and photographic report in PDF format to identify damages or defects of materials, equipment and the site. The Contractor shall submit report electronically to the Contracting Officer and the COTR.

42. PROJECT MEETINGS

42.1. Progress Meetings: The COTR will lead regular progress meetings with an interdisciplinary integrated management team consisting of representatives of the Contractor, Smithsonian, Architect/Engineer Commissioning Provider, major Subcontractors and other critical Subcontractors and suppliers. The purposes of these meetings are to expedite the work, coordinate and schedule the Work and coordinate the work with Smithsonian activities. Progress meetings shall be held weekly unless otherwise directed by the COTR. The time and place of the meetings will be established at the Preconstruction Meeting. The Contractor shall ensure that all required Subcontractors and suppliers attend the Progress Meetings and the COTR will ensure that all necessary SI personnel attend.

42.2. Special-Topic Meetings: At the discretion of the COTR, additional meetings may be scheduled to address issues of quality control, sustainability requirements, coordination between contractors on the premises, coordination with other agencies, scheduling of the work, application for payments, etc. The Contractor's staff and Subcontractors or Suppliers shall attend.

42.3. Meeting Minutes: The Contractor shall promptly prepare minutes of each meeting and transmit, to the COTR, within five (5) working days.

SUBMISSIONS

43. SUBMITTAL DEFINITIONS

43.1. Submittals are defined to include shop drawings, product data, samples and additional data required for submission to the COTR for review and approval prior to incorporation into the work.

43.1.1. Shop Drawings: Detailed drawings, schedules, diagrams and illustrations prepared specifically for this project by the Contractor or any subcontractor, manufacturer, supplier or distributor to illustrate fabrication and/or installation of a portion of the Work.

43.1.2. Schedule: A detailed tabulation of components, items or parts to be furnished for use on this project.

43.1.3. Statement: An affirmation prepared by the Contractor, the installer or manufacturer of a material, product or system, to satisfy a requirement defined in a technical section.

43.1.4. Factory Test Report: A written report of the findings of a test performed by the Contractor on an actual portion of the Work or prototype prepared for this project before it is shipped to the site.

43.1.5. Field Test Report: A written report of the findings of a test performed by the Contractor on a portion of the Work during or after installation.

43.1.6. Certificate of Compliance: A written statement, signed by an authorized official of the manufacturer of a product or system or supplier of a material attesting that the product, system or material meets the requirements of the contract documents. The certificate of compliance must be dated after the award of this Contract and must name the project and cite the specification section, paragraph and requirements, which it is intended to address.

43.1.7. Product Data: Illustrations, standard schedules, performance charts, instructions, brochures, diagrams, manufacturer's descriptive literature and catalog information illustrating a material, product or system to be installed on this project, including all data related to LEED requirements, such as recycled and regional content information, Volatile Organic Compound (VOC) product schedules, Forest Stewardship Council (FSC) chain-of-custody documentation and other documentation as requested by the COTR.

43.1.8. Color Charts: Pre-printed brochures showing the color range of a material.

43.1.9. Test Reports: Reports verifying that a material, assembly, system, process or laboratory meets requirements established in the Contract Documents. Reports shall indicate compliance by naming and describing the test method and test results. Testing must have occurred within three (3) years of the date of award of this contract.

43.1.10. Samples: Physical examples of materials, equipment, assemblies or workmanship establishing standards for evaluating finished Work.

43.1.11. Color/Texture Selection Sample: Samples of an available range of textures and/or colors of a material formed of the actual finish material over a substrate identical to that which will be used in the field.

43.1.12. Mock-up: An assembly or sample panel constructed in accordance with specifications to show construction details, finished appearance and/or performance.

43.1.13. Material Safety Data Sheets: Instructions, warnings and recommended and required handling and use procedures for individual hazardous materials published by the product manufacturer.

44. SUBMITTALS AND REVIEWS

44.1. Contractor Responsibility for Submittals: The Contractor shall provide all required submittals, by technical specification section, in accordance with the contract documents. All submittals, with the exception of mockups or samples, are to be submitted electronically in PDF format, using e-mail, or a cContractor-sponsored FTP site, as directed by the COTR. The Contractor shall clearly indicate, on the submittal, that it has been reviewed by the Contractor and found to meet the project requirements. Any items submitted as substitutions shall be clearly identified as such on the submittal and the transmittal document. If shop drawings show variations from the contract documents because of standard shop practices or for other reasons, the Contractor shall provide a separate, written description of variations along with the submittal. The Contractor shall:

44.1.1. Review each submittal for conformance with requirements of the contract documents and coordination with related work.

44.1.2. Determine and verify all field measurements, required material quantities, method of assembly or erection, installation requirements and proper connection to adjoining materials installed by others.

44.1.3. Assure that all submittals use the appropriate units of measure. All drawings and technical data shall be in SI (metric) units for projects designed in SI units. Preprinted literature in other units shall be accompanied by documentation to show conformance to project requirements.

44.1.4. Transmit all required submittals for a technical specification section at the same time unless prior written waiver of this requirement has been provided by the COTR.

44.1.5. Transmit submittals to the COTR in a logical and orderly sequence in accordance with the Submittal Schedule to prevent project delays or adversely impact work by the Smithsonian Institution or other contractors.

44.1.6. Correct and resubmit submittals according to response from Smithsonian Office Oof Planning, Design & Construction.

44.1.7. Commence work on items requiring submittals only after all related submittals are reviewed and approved by the Smithsonian. All Work shall conform to approved submittals.

44.2. Submittal Schedule and Control Log: The Contractor shall submit, to the COTR, a schedule of work-related submittals using the Smithsonian OFEO Submittal Log form within fourteen (14) calendar days after the effective date of the Notice to Proceed. (Submittal Log form is available on computer disk upon request.) Submittals shall be listed in the order they are scheduled to be submitted and the following information shall be given:

44.2.1. Project Name, Project Number, Contractor Name, Contract Number;

44.2.2. Technical Specification Section for each submittal;

44.2.3. Unique Submittal Number;

44.2.4. Description of item to be submitted, as listed in the specifications;

44.2.5. Date item must be submitted to the Smithsonian in order to support the project schedule;

44.2.6. Subcontractor providing submittal (in "Comments" column).

44.3. Quantities for Submittals: Unless otherwise noted in the technical specification, the Contractor shall deliver to the COTR:

44.3.1. Shop Drawings: Submit electronic copy of shop drawings in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal will be returned to the Contractor electronically, in PDF format. Submit in DWG format, if requested.

44.3.2. Product Data, Test Reports, Color Charts, etc.: The Contractor will make submittals in electronic format, preferably PDF.

44.3.3. Color/Texture Samples: Submit two (2) samples, minimum size 600 mm by 600 mm, unless otherwise specified. After submittal review, one (1) sample may be retained by the Smithsonian.

44.3.4. Mock-up and Sample Installations: Unless otherwise specified, minimum size shall be as noted to complete a panel section or normal break in the work.

44.3.5. Written Text Documents, Plans and Reports: Submit electronic copy of written text documents, plans and reports in PDF format. Submittal will be forwarded electronically to the AE for review. After submittal review, submittal will be returned to the Contractor electronically, in PDF format.

44.4. Submittal Reviews by the Smithsonian: Reviewed submittals will be marked "Approved," "Approved as Noted," "Resubmit" or "Disapproved." Submittal approval by the Smithsonian shall not relieve the Contractor of responsibility for submittal errors, omissions or deviations from the contract documents. Approval of submissions does not constitute acceptance of substitutions except as covered under sub-paragraph entitled "Contract Requests for Substitutions."

44.5. Submittal Review Period: The Contractor shall transmit, to the COTR, all submittals sufficiently in advance of the time necessary for fabrication and installation to allow for review by the Smithsonian and return to the Contractor, including any time needed for correction and resubmission by the Contractor. The expected time required by the Smithsonian for review of initial submission is 14 calendar days. No extension of the Contract Time will be granted for the Contractor's failure to allow sufficient time for review and processing, including resubmission of items, which initially rejected due to improper submission or non-compliance with the Contract Documents.

44.6. Contractor Requests for Substitutions: Contractor requests for items identified by manufacturer, brand name, make, catalog number, etc. in the contract documents shall be submitted to the Contracting Officer for approval prior to contract award, in accordance with the General Conditions. After award of the contract, contractor requests for substitutions may be considered and accepted by the Smithsonian at the discretion of the Contracting Officer.

45. CRITERIA FOR PRODUCT SELECTION

45.1. To the greatest extent possible, subject to the restrictions of the Buy American Act, provide products, materials or equipment of a singular generic kind from a single source. Where more than one choice of a product or material is available for Contractor's

selection, select an option, which is compatible with other products and materials already selected.

45.2. Provide products complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation for intended use and effect.

45.3. Products, which, by nature of their application, are likely to be needed at a later date for maintenance and repair or replacement work, shall be current models for which replacement parts are available.

45.4. Product selection shall be done in accordance with the following requirements:

45.4.1. Standards, Codes and Regulations: Select from among products that are in compliance with the project requirements, as well as with construction standards, all applicable codes and regulations and LEED requirements.

45.4.2. Performance Requirements: Provide products that comply with specific performances indicated and are recommended by the manufacturer (in published product literature or by individual certification) for the application indicated.

45.4.3. Prescriptive Requirements: Provide products that have been produced in accordance with prescriptive requirements, using specified ingredients and components and complying with specified requirements for mixing, fabricating, curing, finishing, testing and other operations in the manufacturing process.

45.4.4. Visual Matching: Where matching with an established sample for color, pattern and/or texture, the COTR shall determine whether a proposed product matches the sample.

45.4.5. Avoidance of banned materials: The Contractor will commit to not using the following toxic and hazardous materials:

45.4.5.1. Products containing asbestos, urea formaldehyde, polychlorinated biphenyls (PCBs) and/or chlorinated fluorocarbons;

45.4.5.2. Products containing lead content, including older or flux containing more than 0.2 percent lead; domestic water pipe or pipe fittings containing more than 8 percent lead; and paint containing more than 0.06 percent lead.

46. PROGRESS PHOTOGRAPHS

46.1. The Contractor shall provide photographs of the project site and construction activities throughout the progress of the Work. The COTR shall determine the vantage points from which photographs will be taken.

46.2. At least six (6) color progress photographs shall be taken daily. The actual number and location of views shall be directed by the COTR. Photographs shall be taken at the start and finish of various elements of construction designated by the COTR.

- 46.3. At the end of each day submit to the COTR, via email or other electronic means, JPEG and PDF files. For all photographs taken that day. submit a plan marked up to show the location the photographs were taken from.

47. CONTRACTOR CORRESPONDENCE AND DAILY REPORTS

47.1. The Contractor shall correspond with the COTR for all matters related to this construction project, unless otherwise directed. All correspondence shall be signed and dated by the Contractor and shall reference the project, project number and contract number.

47.2. The Contractor shall maintain daily reports using the Smithsonian Institution Contractor's Daily Report form. Reports shall be numbered consecutively and all sections shall be completed or noted as "not applicable." Reports shall contain detailed remarks each day, including but not limited to progress on the job, problems discovered and discussions with Smithsonian staff. Reports shall be submitted to the COTR each day for the previous workday. In addition, reports are to be submitted for days no work is performed on site throughout contract duration.

47.3. All correspondence with the Smithsonian Institution shall be in the English language.

SAFETY, HEALTH AND FIRE PROTECTION

48. JOBSITE SAFETY

48.1. Safety Coordinator: The Contractor shall designate a person responsible for safety at the project site for the duration of the project.

48.2. Jobsite Safety Plan: The Contractor shall submit a Jobsite Safety Plan within thirty (30) calendar days of the Contract Award and at least ten (10) calendar days prior

to mobilization to the site for approval by the COTR. As a minimum, the plan shall detail the procedures, designated persons, instructions and reports to be used to assure jobsite safety for all contractors, subcontractors, Smithsonian personnel, the public and others on the site.

48.3. Occupational Safety and Health: This contract is subject to Title 29 of the Code of Federal Regulations, Part 1910 "Occupational Safety and Health Standards" and Part 1926 "Safety and Health Regulations for Construction" pursuant to the Occupational Safety and Health Act (OSHA) of 1970 administered by the US Department of Labor, Occupational Safety and Health Administration.

48.4. Emergency Assistance: The Contractor shall post, at the site, telephone numbers for reporting emergencies, including the Smithsonian Office of Protection Services (OPS), ambulance, police, fire department, gas utility, electric utility, water/sewer utility, poison prevention aid and hazardous-waste handling. This information shall be posted in a conspicuous location within the project area prior to the start of any work at the site.

48.5. Safety Signs: The Contractor shall post legible accident prevention signs in construction areas in accordance with OSHA standards. Safety signs shall conform to ANSI 235.1 and 235.2 Vehicular traffic control devices, barricades and signals shall conform to ANSI D6.1.

48.6. Report of Accident or Illness: In the event of any accident or illness for which medical assistance is required, any criminal action or any fire, the Contractor shall notify the appropriate authority (Ambulance, Police, Fire Dept.), Smithsonian Security and the COTR.

48.7. Emergency Evacuation: The Contractor shall post evacuation routes and facility emergency/self-protection plans at the site, train all employees in emergency procedures and document such training. In the event of a fire, the Contractor shall immediately activate the alarm at the nearest fire alarm pull station and notify building security. Upon the activation of the audible alarm, the building will be evacuated. No personnel shall reenter the facility until security personnel signal that the building is safe.

48.8. Contractor Personnel to be Contacted: The Contractor shall submit a written list of emergency telephone numbers and names of persons to contact for the General Contractor superintendent and for each major sub-contractor working on the project site. The initial list shall be submitted to the COTR at the Preconstruction Meeting. The list shall be updated and resubmitted to the COTR as needed.

49. TOXIC AND HAZARDOUS SUBSTANCES

49.1.

1. The Contractor shall submit to the COTR for approval, at least ten (10) working days prior to their intended use, a written list of toxic and hazardous substances that will be used on the project. The Contractor shall submit a "Material Safety Data Sheet" similar to OSHA Form No. 20 for these substances to identify the following information:

    49.1.1. Product Identification;

    49.1.2. Hazardous Ingredients;

    49.1.3. Physical Data;

    49.1.4. Fire and Explosion Hazard Data;

    49.1.5. Health Hazard Data;

    49.1.6. Emergency and First Aid Procedures;

    49.1.7. Reactivity Data;

    49.1.8. Spill or Leak Procedures;

    49.1.9. Special Protection Information;

    49.1.10. Special Precautions;

    49.1.11. Volatile Organic Compound (VOC) Content.

2.

49.2. The Contractor shall monitor the use of all toxic and hazardous substances to ensure that exposure to their workers from airborne concentration of, or physical contact with, these substances does not exceed applicable regulatory worker health and safety exposure limits.

49.3. The Contractor shall monitor the use of all toxic and hazardous substances to ensure that exposure to Smithsonian Institution employees and visitors from airborne concentrations of, or physical contact with, these substances is maintained as low as reasonably achievable. Under no circumstances shall exposure exceed the established Short-Term Exposure Limit or 50% of the established Threshold Limit Values or Permissible Exposure Limits (whichever is less) as specified in either:

49.3.1. "Threshold Limit Values and Biological Exposure Indices" of the American Conference of Governmental Industrial Hygienists, latest revision or

49.3.2. Title 29 CFR Part 1910, Subpart Z - "Toxic and Hazardous Substances" of the Occupational Safety and Health Standards, latest revision.

49.3.3 Submit a workplan to the COTR for approval of means and methods for monitoring airborne concentrations.

49.3.4 Cease work immediately and notify the COTR if airborne concentration exceeds the parameters noted.

49.4. The Contractor shall provide methods, means and facilities to prevent contamination of soil, water and atmosphere from discharge of noxious, toxic substances and pollutants produced by construction operations. The removal of contaminated waste shall be in compliance with applicable laws and regulations.

49.5. To achieve compliance with the requirements of this section, administration or engineering controls shall first be implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep exposure of all persons within the prescribed limits. Descriptions of equipment or technical measures to be used for this purpose must be submitted to the COTR for approval. The Contractor's requirements for compliance with all applicable Local, Federal and State regulations remain in force.

49.6. The SI may reject any product that poses a high risk of fire or health hazard to staff, visitors or the building, based on flammability criteria (e.g. low flashpoint) or established toxicity data (e.g. designation as a human carcinogen).

49.7. The Contractor shall submit, to the COTR, a list of the hazardous materials to be stored on site and the manner in which they will be stored. All containers and storage cabinets shall be approved by the COTR and labeled as to hazard and content.

49.8. The SI has made every effort to identify and to notify the Contractor of hazardous materials that may be encountered during the work. However, if suspected asbestos-containing material, lead-based paint or other suspected hazardous materials are encountered during demolition or other phases of the work, the work involving the suspected material shall cease and the Contractor shall notify the COTR immediately.

50. PERSONAL PROTECTIVE EQUIPMENT

50.1. Personal protective equipment for eyes, face, ears, nose, head, extremities and/or full body shall be provided, used and properly maintained by the Contractor whenever necessitated by reasons of hazards encountered in a manner capable of causing illness, injury or impairment in the function of any part of the body.

50.2. Persons required to use personal protective equipment shall be thoroughly trained. Training programs shall, as a minimum, meet OSHA and EPA requirements where applicable. The Contractor shall submit proof and criteria for employee training as requested.

51. BARRICADES, BARRIERS AND WALKWAYS

51.1. The Contractor shall provide safety barricades in accordance with the District of Columbia Building Code and applicable OSHA regulations. The Contractor shall also provide barricades, subject to approval by the COTR, to deter passage of persons and/or vehicles into construction areas as specified or necessary.

51.2. The Contractor shall install temporary barriers, in a manner satisfactory to the COTR, to contain and secure the site from unauthorized entry and to minimize the adverse effects of noise, dust and vapors generated by construction activities on surrounding areas. Barriers shall be constructed of pressure-impregnated fire-retardant treated wood, with fire-retardant 6-mil polyethylene as necessary. Submit all product data to the COTR for review and approval.

51.3. If the work interferes with public or employee access to the facility or parts of the facility, as determined by the COTR, the Contractor shall provide personnel barriers and signage to create easily identifiable, accessible (to people with handicaps) walkways around the work. Signs shall be posted at decision points to prevent unnecessary travel along changed routes and to dead ends. The barriers shall be erected and dismantled in phases so that a clear route is always available. The COTR and Contractor personnel shall have access through the barriers to the work areas. The Contractor may use hardware on the barrier doors to prevent entry by unauthorized persons.

51.3.1. Exterior barriers shall be of dimensional lumber and plywood, painted on both sides and supported to prevent overturning. Barriers shall be repainted and maintained as necessary to remain in good condition as long as they are required.

51.4. Unless specifically indicated otherwise, barricades, barriers and associated signs shall be removed upon completion of the Work. The Contractor shall coordinate the dismantling and removal with the COTR.

52. EXISTING FIRE PROTECTION SYSTEMS

52.1. During the course of the Work, all existing smoke and heat detectors and sprinkler heads are to remain operable to the maximum extent possible. Where specific work will or may adversely affect these devices, coverings shall be applied to protect them from dust, paint overspray or other hazardous conditions for the duration of each task. Written permission shall be obtained in advance of work from the COTR. A qualified person shall remain on site during operations while heads are covered. Coverings must be removed immediately after the operations have concluded for that day. Damaged detectors and sprinkler heads shall be replaced immediately by the Contractor at no additional cost to the Smithsonian Institution. The Contractor shall use accepted procedures to test replaced detectors and sprinklers after installation to the satisfaction of the COTR.

52.2 If a fire protection or life safety system must be impaired for modifications or adjustments during the project, the Contractor shall obtain a daily "Fire System Impairment Permit." Each permit must be obtained at least two (2) working days in advance from the Building Managers Office and be posted at the jobsite prior to beginning the scheduled work.

SECURITY REQUIREMENTS

53. GENERAL SECURITY REQUIREMENTS

53.1. The Contractor and his employees must comply with security requirements imposed by the Smithsonian Institution, including any necessary security clearances. Failure to inspect the site or obtain knowledge of security regulations shall not relieve the Contractor from security requirements or from performance of any part of the work.

53.2. Prior to the start of work on the site, the Contractor shall submit, to the COTR for approval, a list of the names, social security numbers and addresses of all employees and subcontractor employees. The list shall identify the Prime Contractor and each subcontractor and trade. It shall be updated, as necessary, to accurately identify all workers who will be working on the site during the project.

53.3. The name and telephone number of the Contractor's Superintendent and authorized alternate individual who can be reached on a 24-hour basis shall be provided to the COTR at the Preconstruction Meeting.

54. IDENTIFICATION BADGES

54.1. Controlled Access: Contractor employees shall sign in and out with the security officer on a daily basis for the duration of the Contract Time. Access to the building will

be granted only to Contractor employees who sign the Building Entry and Departure Register at designated entrances and who wear a Contractor Identification Badge or Day Pass in plain view for inspection. Photo identification badges with serial numbers and information about allowed access may be issued by the Smithsonian to some Contractor employees.

54.2. ID Processing: Contractor personnel will be issued identification badges for use while on the premises.

54.2.1. ID badges will be provided by the Smithsonian at no cost to the Contractor. Smithsonian reserves the right to not issue ID badges to those Contractor employees who fail to meet security requirements.

54.2.2. The Contractor shall submit, to the COTR, a written request for approval of each employee who will be working on site and was not on the original list. Each application must be submitted at least five (5) working days before the employee is scheduled to begin on the project.

54.2.3. After obtaining a temporary official Smithsonian Institution identification badge, contractor personnel will be issued an MSC photo identification badge. The Contractor shall submit an application, SI Form 3513, for each contractor employee that will be working on site. Contractor employees not in possession of an MSC photo will be admitted to the facility only if an authorized MSC staff member approves the issuance of a day pass. Smithsonian cannot guarantee access for persons without an MSC photo badge.

54.3. ID Pickup: Contractor's personnel reporting for work shall be required to sign the building entry and departure register and to exchange a driver's license or some other photo identification for the Contractor Identification Badge or Day Pass. The personal identification exchanged for the badge or pass will only be returned to its owner when the credential is returned.

54.4. Accountability for ID: Contractors who are issued an identification badge or day pass are strictly accountable for it and for following established access control procedures. Misuse of the credential, noncompliance with access control procedures or failure to return the ID badge or day pass upon leaving the premises shall be reported to the COTR.

54.5. Lost ID: If a Contractor or subcontractor employee loses an ID badge or day pass, the Contractor shall report the loss immediately to the COTR. The Contractor shall submit to the COTR, within two (2) calendar days, a written report detailing how, where and when the credential was lost. A request to the COTR for authorization of a

replacement credential, if necessary, shall accompany this report. The Contractor shall bear the cost for replacement of the lost badge or pass.

54.6. Ownership of ID: The Contractor Identification Badge or Day Pass shall remain the property of the Smithsonian and it shall not be taken off the premises. The badge will be issued to the person it identifies when he reports to the work site for duty and it must be returned to the security guard station whenever the person it identifies leaves the premises.

55. ACCESS AND PROPERTY CONTROL AT THE MUSEUM SUPPORT CENTER

55.1. MSC entry location for Contractors: Contractors will be permitted to enter the Museum Support Center only through the personnel door at the MSC loading dock. No one is to enter or leave the MSC through another door except in case of an emergency evacuation or with specific authorization of the MSC security office.

55.2. Zoned work areas inside MSC: Contractors admitted to the Museum Support Center are permitted to enter only those areas in which they are performing project work, areas through which they must pass in order to reach their work area or designated break, commons or comfort areas. Key cards control access to most of the areas within the MSC. Contractors needing access to key-card controlled areas must be escorted.

55.3. MSC areas secured while occupied: Certain areas within the Museum Support Center will be kept locked whether they are occupied or unoccupied. Access to these secured areas will be strictly controlled and Contractors working within them must be escorted at all times. Arrangements for security escorts must be made at least seventy two (72) hours in advance of any work being done within secured areas. The MSC guard station will control all keys and will not issue keys to the Contractor.

55.4. Property control at MSC: Contractors entering the Museum Support Center will be required to register, in a log book, any personal property and equipment(i.e. lunch pails, tool chests, tools, etc.) that they are carrying into the MSC. All property being removed from the MSC is subject to inspection by MSC security personnel. Property cannot be removed from the premises if it has not been properly registered in the logbook or issued an authorized property pass. Property passes, SI Form 3143, must be signed by an authorized MSC staff member and presented to MSC security personnel.

55.5. Published security regulations for MSC: Published security regulations for the Smithsonian Museum Support Center may be obtained from the MSC guard station.

56. SECURITY OF TEMPORARY OPENINGS

56.1. Any temporary opening in the building perimeter or between non-public and public interior spaces must be closed and secured with means acceptable to the COTR at the end of each workday. A clear and safe path shall be maintained at all times to allow museum visitors entrance into the museums. The Contractor shall secure his facilities and equipment during non-working times at his own expense. Authorized Smithsonian personnel shall have access to the work site.

57. EXISTING BUILDING ALARM SYSTEMS

57.1. The Contractor shall notify the COTR prior to disturbing any alarm wiring, device, system, etc. The Contractor shall coordinate planned disturbances at least two (2) working days in advance of the scheduled work. Any alarm wiring, device or system that is broken or disturbed for any reason must be reported to the Building Manager, COTR and the Building Security Control Room within three (3) minutes of the occurrence.

57.2. If any system or component is damaged by Contractor employees, the Smithsonian Institution Office of Protection Services will determine the procedures for repairing the damage to existing building alarm systems and who will perform the repair work. The cost to repair the system and any related overtime costs for Smithsonian personnel shall be borne by the Contractor.

58. SECURITY GUARD DUTY CHARGES

58.1. If the Contractor is required to accelerate the work in order to complete the project within the specified Contract Time or if other conditions arise as a result of the Contractor's management of the work, which require that construction be accomplished during other than the normal workdays and hours defined for this project, the Contractor will be required to assume the cost of any additional inspection and guard services at overtime rates.

58.2. The current overtime hourly rate charged for each Smithsonian guard is *$47.00. This rate is subject to change during the Contract Time without notice.

SCHEDULES AND PAYMENTS

59. SCHEDULE OF VALUES

59.1. The Contractor shall submit, to the COTR, a schedule of estimated values of all parts of the work. The breakdown of costs on the Schedule of Values shall follow the

divisions used in the project specifications and shall reflect major items and groups of items shown on the Contractor's project schedule. All values shall be in US dollars.

59.2. Wages: The contractor shall verify wages and comply with regulated wage scales, i.e. Davis-Bacon, Service Contract Act, etc.

60. SCHEDULING & PAYMENTS / BAR CHART

60.1. Project Schedule: The Contractor shall submit to the COTR for approval a Gantt bar chart project schedule within fourteen (14) calendar days after the date of contract award. Submit Project Schedule in both PDF format and original scheduling software format. No work shall start at the site until the project schedule has been approved by the COTR. The approved bar chart will represent a baseline schedule on which the monthly construction progress will be indicated and submitted to the COTR. The baseline project schedule shall comply with the following:

60.1.1. Weekly breakdown of work activities shall be provided, including interaction between building trades, subdivided by items of work and areas of the project. Items of work shall be grouped and subdivided according to the divisions of the Construction Specifications Institute (CSI) format.

60.1.2. The start date and completion date shall be consistent with the Contract Time established by the Contracting Officer. Any intermediate deadline dates needed to meet specific requirements for Smithsonian use of portions of the work shall be shown.

60.1.3. Project condition survey activities shall be scheduled not later than the 14th calendar day of the contract time and prior to the start of any site work.

60.1.4. Project closeout activities shall be scheduled for completion in accordance with the requirements for the Contract Time for Completion.

60.1.5. Order dates and projected delivery dates shall be shown for equipment, special devices, hardware, products or other items requiring long lead-time.

60.1.6. Required delivery dates for items to be furnished by Smithsonian and installed by the Contractor shall be shown, as well as items to be furnished and installed by Smithsonian, which will affect the Contractor's work.

60.1.7. Review periods for all submittals and time required for all necessary inspection and/or testing shall be shown.

60.1.8. Dates shall be given for ordering, delivery, installation and testing of major equipment and special materials and equipment.

60.2. Revisions to Baseline Schedules: The Contractor shall submit, to the COTR for approval, all revisions to the approved baseline project schedule. The Contractor shall submit a proposed revision to the schedule as necessary along with proposals for construction changes, clearly indicating modifications to the schedule based on the proposal. The Contractor shall also submit, for review and approval, any proposed changes to the schedule due to inability to accomplish the work as planned, for any reason. Approved changes to the schedule shall be incorporated into the Project Schedule and it shall be resubmitted as necessary or as requested by the COTR.

60.3. Progress Behind Schedule: If it becomes apparent to the COTR that the overall progress of the project is behind the approved project schedule, then the COTR will notify the Contractor in writing. The Contractor shall submit to the COTR for approval a Recovery Schedule and Plan to describe how the Work will be accelerated to meet the Contract Time requirements in accordance with the General Conditions contract clause entitled "Commencement, Prosecution and Completion of the Work." The Recovery Schedule shall be superimposed on the approved baseline project schedule to demonstrate that proposed recovery activities will accomplish completion of the work by the approved completion date.

60.4. Reporting Progress and Applying for Payment: Each month, the Contractor shall apply for payment and submit a report of the actual construction progress as follows:

60.4.1. By the 25th of each month, the Contractor and the COTR shall have inspected the work to determine percentages complete for each item, projected through the end of the month. The parties shall attempt to reach agreement on each item, but if they cannot reach an agreement the COTR will determine percent complete.

60.4.2. By the last day of the month, the Contractor shall submit an Application for Payment based on the determined percentages complete for each item. The application shall be submitted in triplicate on the Smithsonian standard Application for Payment form. Each copy of the Application for Payment shall be accompanied by the following:

1. A Progress Schedule identifying the cumulative progress superimposed on the latest revision of the approved Project Schedule.

The net progress for the month and applicable dates shall be clearly indicated.

2. A complete set of copies of certified weekly-payroll data for the period.

60.5. Response to Application:

60.5.1. Payment shall be made only for progress agreed upon by the COTR, performed on original Contract Work or approved modifications, in accordance with the current, approved Project Schedule. Failure to submit the Application in accordance with the specifications will prevent the processing of payments.

60.5.2. Payments will be mailed to the Contractor's address as identified in the contract documents on record with the Contracting Officer. Any changes of address or requests for wire transfer of progress payments must be made in writing, signed by the Contractor's authorized person and submitted to the Contracting Officer.

61. SCHEDULING & PAYMENTS / CRITICAL PATH METHOD -NOT USED

62. ASSIGNMENT OF CLAIMS

62.1. Assignment of Claims are subject to the approval of the Contracting Officer. Any Assignment of Claim or subsequent re-assignment shall meet the requirements of the General Conditions contract clause entitled "FAR 52.232-23 Assignment of Claims."

62.2. All documents for assignments shall be written in the English language and shall be original ink signatures of the Contractor and assignee. All monies shall be identified in US dollars.

ROJECT CLOSEOUT REQUIREMENTS

63. PROJECT CLOSEOUT

63.1. Definition: Project closeout is a scheduled process for fulfillment of remaining contract requirements at the end of the project in preparation for final acceptance, final payment, normal termination of contract, beneficial occupancy and establishment of the warranty period(s).

64. SUBSTANTIAL COMPLETION

64.1. Definition: The date of Substantial Completion of a project or specified part of a project is the date, as confirmed by inspection by the COTR, when the construction is at least 95% complete and water tight.

64.2. Request for Substantial Completion Inspection: The Contractor shall submit a written request to the COTR for an inspection to establish Substantial Completion status. This request shall specify areas or parts of the work to be considered and shall include a listing of all exceptions to the request, that is, items not considered to be substantially complete.

64.2.1. Approved product data, shop drawings and system as-builts.

64.2.2. Copies of approved certifications and laboratory test reports (where applicable).

64.2.3. Notarized copies of warranties (originals to be provided as required by "Warranties and Guarantees").

64.2.4. Name, address and telephone number of each subcontractor.

64.4. Other Prerequisites for Substantial Completion Inspection: The Contractor shall also complete the following prior to requesting inspection for certification of substantial completion:

64.4.1. Removal of all waste, rubbish and temporary facilities and services. Means of access to all areas of the work to be inspected by the COTR shall be maintained.

64.4.2. Disposition of samples and mock-ups not incorporated into the work.

64.4.8. Arrangement for transfer of security responsibility for the project site

64.4.9. Hazardous Waste Disposal: Submit copies to the COTR of the following hazardous waste records for hazardous waste generated on SI property and disposed of by contract personnel.

1. Hazardous Waste Manifests
2. Notification and Certification Forms

3. Material Profile Sheet or characterization
4. Container Content Sheets
5. Certificates of Disposal

64.5. Scheduling of the Substantial Completion Inspection: Within seven (7) calendar days after receipt of the Contractor's written request, the COTR will either schedule an inspection or advise the Contractor of work that must be completed or prerequisites that must be met prior to scheduling the Substantial Completion Inspection. In that case, another written request for Substantial Completion Inspection must be submitted when all requirements have been met.

64.6. The Substantial Completion Inspection: The Substantial Completion Inspection will be performed by representatives of the Smithsonian Institution led by the COTR. During the inspection, the COTR will prepare a punch list of deficiencies in the work. If the punch list becomes too extensive the COTR may cancel the inspection and require additional work to be performed for a repeat inspection.

64.6.1. For satisfactory inspection results, the COTR will issue the written punch list to the Contractor as soon as possible after the inspection. Items on the punch list must be completed prior to final acceptance of the total project work.

64.6.2. For unsatisfactory inspection results, the COTR will, within three (3) calendar days, give written notice to the Contractor that the Work or portion of the Work is not substantially complete in accordance with the contract documents and therefore does not meet Substantial Completion status. Requests for re-inspection shall meet all requirements for the original request for Substantial Completion inspection.

64.7. Punch List: Incomplete contract requirements identified during the Substantial Completion Inspection will form an initial basis for a punch list for final acceptance. All punch list items must be completed by the Contractor within the Contract Time. If additional days are needed to complete the punch list items beyond the Contract Time, then the Contractor shall submit, prior to the end of the Contract Time, a written request to the Contracting Officer stating:

64.7.1. Items requiring additional time;

64.7.2. Amount of time needed to complete each item;

64.7.3. Reasons why the items cannot be completed by the contract completion date.

65. FINAL COMPLETION AND ACCEPTANCE

65.1. Definition: The date of final completion of a project is the date, as confirmed by inspection by the COTR, when the Work is satisfactorily completed and accepted in accordance with the contract documents, as amended and/or modified.

65.2. Request for Final Completion Inspection: When all items on the punch list have been corrected to the satisfaction of the COTR and additional requirements as described below have been satisfied, the Contractor shall submit a written request for Final Completion Inspection.

65.3. Prerequisites for Final Completion: Prior to requesting the inspection for certification of Final Completion, the Contractor shall complete the following:

65.3.1. Submission of a copy of a prior punch-list stating that each item has been completed or otherwise resolved for acceptance.

65.3.2. Submission of original warranties for all products, and systems.

1. The Contractor shall assemble original warranty certificates or notarized copies of warranty certificates executed by the Contractor, Subcontractors, suppliers and manufacturers in a tab-indexed, three-ring loose-leaf binder with a durable plastic cover. Provide electronic copy, in PDF format, on CD. The table of contents shall identify the item covered, the location of the item, the date of Substantial Completion, expiration date of the warranty and the supplier, vendor and installing contractor. Duplicate notarized copies of warranties shall be provided as required by "Manuals for Operation, Maintenance and As-Built Product Data."

2. Each warranty certificate or bond shall identify the date(s) for:

(1) Substantial Completion status in accordance with project closeout requirements.

(2) Beginning and ending of the warranty period.

(3) The Contractor shall provide any coincidental product warranty, which is available on a product incorporated in the Work, but for which the warranty is not specifically required by the contract documents.

3. Warranty of Construction: The Contractor shall warrant that the work performed under this contract conforms to the Contract requirements and is free of any defect in equipment, materials, design furnished or workmanship performed by the Contractor or any subcontractor or supplier at any tier. Unless otherwise stated in the technical sections of the Specifications, the warranty of the Work shall continue for a period of one (1) year from the date of Final Completion status.

65.3.3 Submission of construction progress photographs and similar final record information. Photographs to be labeled for date and location in addition to general project labeling.

65.3.4. Submission of evidence that all regulatory agency permits and code requirements have been completed and recorded, as necessary.

65.3.5. Submission of a signed, written statement that no damage has occurred to the site as documented by the pre-condition survey report.

65.3.6. Final clean up, including:

1. Sweep and dust all surfaces and wash all finished surfaces to appear new and free of all stains, soil marks, dirt and other forms of defacement.

2. Remove labels that are not required as permanent labels.

3. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances that are noticeable as vision-obscuring materials. Replace broken glass and damaged transparent materials.

4. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of dust stains, films and similar noticeable substances. Except as otherwise indicated, avoid disturbance of natural weathering of exterior surfaces. Restore reflective surfaces to original reflective condition.

5. Wipe surfaces of equipment clean. Remove excess lubrication and other substances.

6. Remove debris and surface dust from limited-access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.

7. Wet-mop concrete and clean other hard-surface floors according to manufacturers' recommendations.

8. Clean project site (yard and grounds) of litter and foreign substances. Sweep exterior paved areas to a broom-clean condition; remove stains, petro-chemical spills and other foreign deposits. Rake grounds, which are neither planted nor paved, to a smooth, even textured surface.

65.4. Inspection of the Work for Final Completion: Upon receipt of the Contractor's written notice that the work has been completed, the COTR will inspect the work to confirm Final Completion status and acceptance of the work. As soon as possible after inspection, the COTR will either provide written acknowledgment of final acceptance or advise the Contractor of work not completed or obligations not fulfilled as required for final completion and acceptance.

65.5. Application for Final Payment:

64.5.1. Application for Final Payment shall be submitted only after Final Acceptance has been certified in writing to the Contractor by the COTR. Application shall include final labor data and progress schedule update.

64.5.2. Final Payment will be approved when Final Acceptance has been certified and the following conditions have been met:

a. Certification signed and submitted by the Contractor that all contract requirements, including contract modifications, have been met.

b. Final Release of Claims submitted.

c. Release of assignment of claims or consent of surety submitted, as necessary.

d. All security ID badges and parking permits returned to Smithsonian.

e. As-Built Record Drawings Submitted: During the progress of the work the Contractor shall maintain a complete and up-to-date set of

record prints, open to inspection by the COTR at any time. These prints shall provide a complete and accurate as-built record of all changes to the Contract Drawings, including rerouting of runs, relocation of items or control points and all other modifications. As-built drawings shall be neatly marked with colored pencils or ink, marked "As-Built" and signed and dated by the Contractor. Upon completion of the Work and before final payment, the Contractor shall submit the following to the COTR: photographically produced as-built record drawings on 4-mil, double matte, mylar sheets, sized the same as the contract drawings; electronic copies of as-built record drawings in PDF and DWG formats.

f. As-Built Record Specifications Submitted: The Contractor shall submit one (1) hard copy and one digital (scanned)set of project specifications with annotations to identify any changes made during construction, referencing modification numbers, dates and originators of authorizing letters or memos and other sources of changes. The cover shall be marked "As-Built" and signed and dated by the Contractor.

g. Close-out Conditions Text and Photographic Documentation Submitted: The Contractor shall prepare a typewritten text and photographic report of observations made during the inspections for project closeout regarding conditions of new work and adjacent items that were examined for the pre-condition survey report. Any defects shall be identified and the Contractor's operations on the defect shall be described. Within ten (10) calendar days after the Final Inspection, the Contractor shall submit the text and photographic report in PDF format to the Contracting Officer and the COTR and retain a copy of each for the Contractor’s files.

END OF SUPPLEMENTARY CONDITIONS FOR CONSTRUCTION

SECTION 02 2000 – PHOTOGRAPHS OF EXISTING CONDITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Photographs of existing conditions

a. The following photographs were taken in the fall of 2017. They show typical and special conditions at that time. Locations of all objects and structure must be field verified.
b. Photographs are included to supplement the drawings in showing the nature and extent of existing conditions and describing the work.

1.3 PHOTOGRAPHS OF EXISTING CONDITIONS

Photo #1: Overall plan of existing MSC: Pod 5 roof and Mechanical building

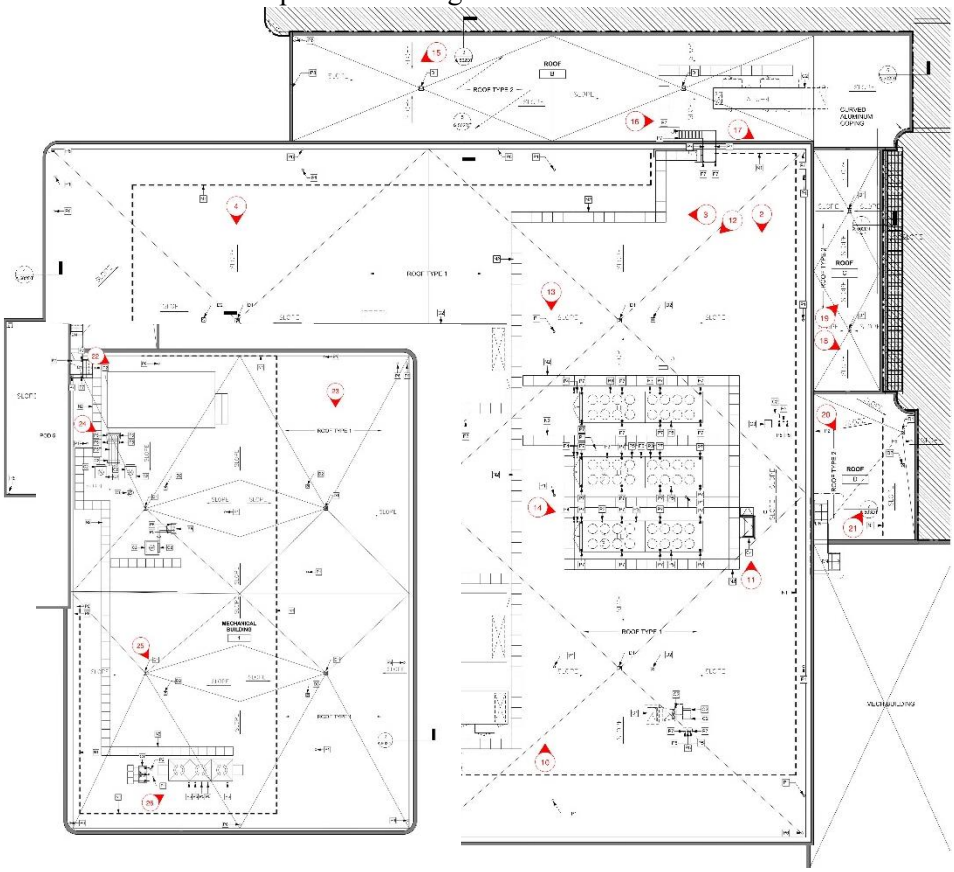

Photo #2: Looking towards Chiller

Photo #3: Looking towards AHU-1

Photo #4: Current roof condition

Photo #5: AHU-1 extrusions

Photo #6: Looking towards AHU-2

Photo #7: Typical duct connection

Photo #8: Looking towards AHU-2 and AHU-5

Photo #9: Current roof condition

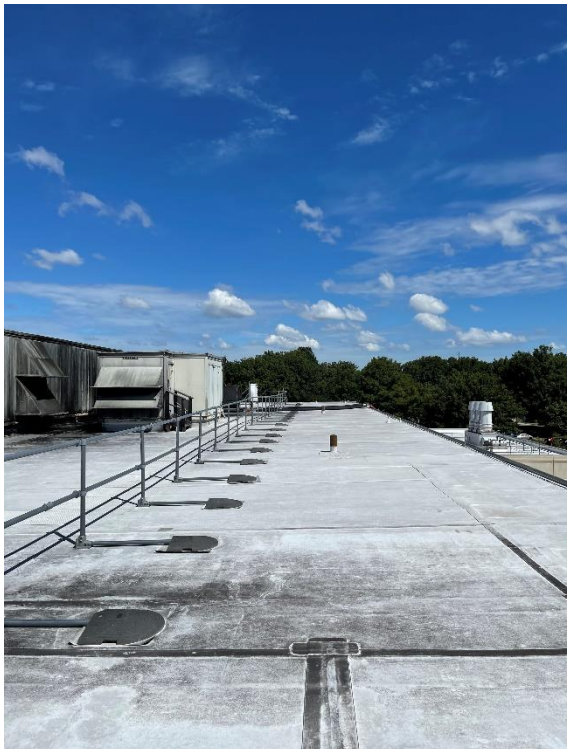

Photo #10: Looking towards Chiller and AHU-5

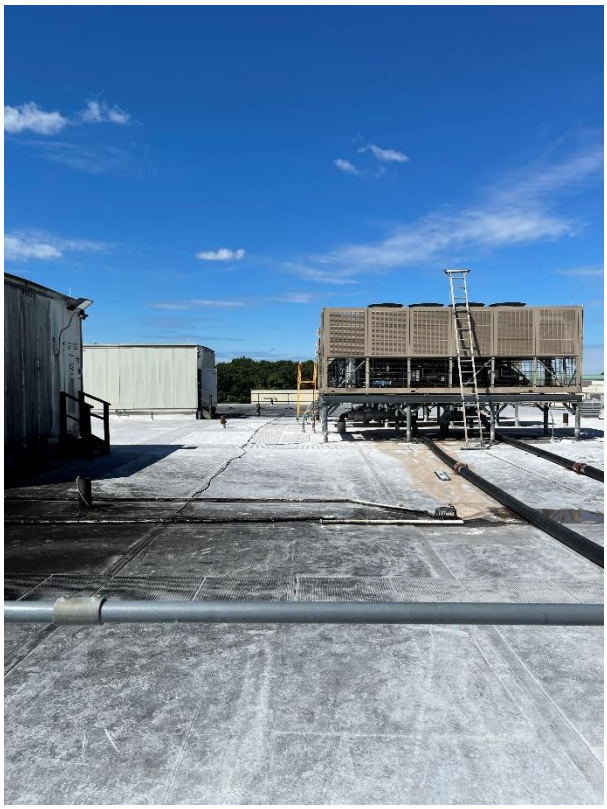

Photo #11: Looking towards roof hatch

Photo #12: Current conditions on Pod 5

Photo #13: Looking towards the space between Chiller and AHU units

Photo #14: Looking towards the Chiller unit

Photo #15: Roof B

Photo #16: Looking towards AHU-4

Photo #17: Detail between Roof B and Pod 5

Photo #18: Looking towards Roof C

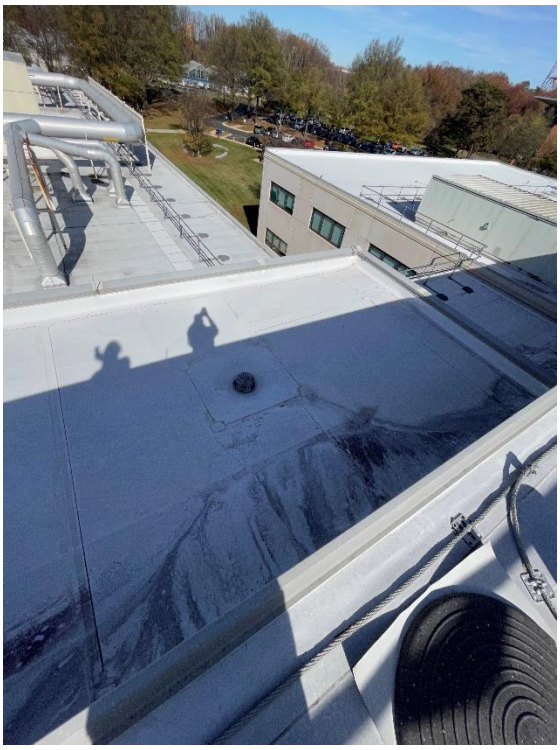

Photo #19: Looking towards Roof C

Photo #20: Roof D

Photo #21: Roof D

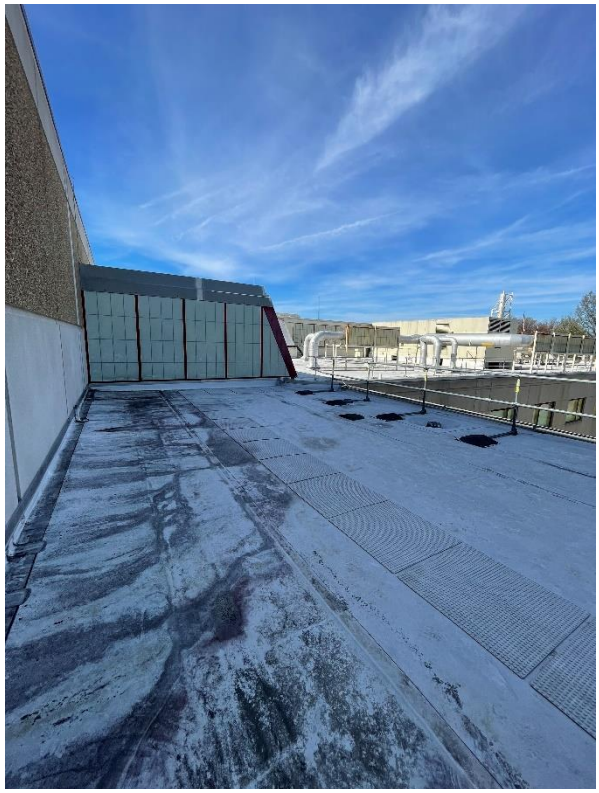

Photo #22: Connection between Mechanical Building and Roof D

Photo #23: Current conditions on Mechanical Building

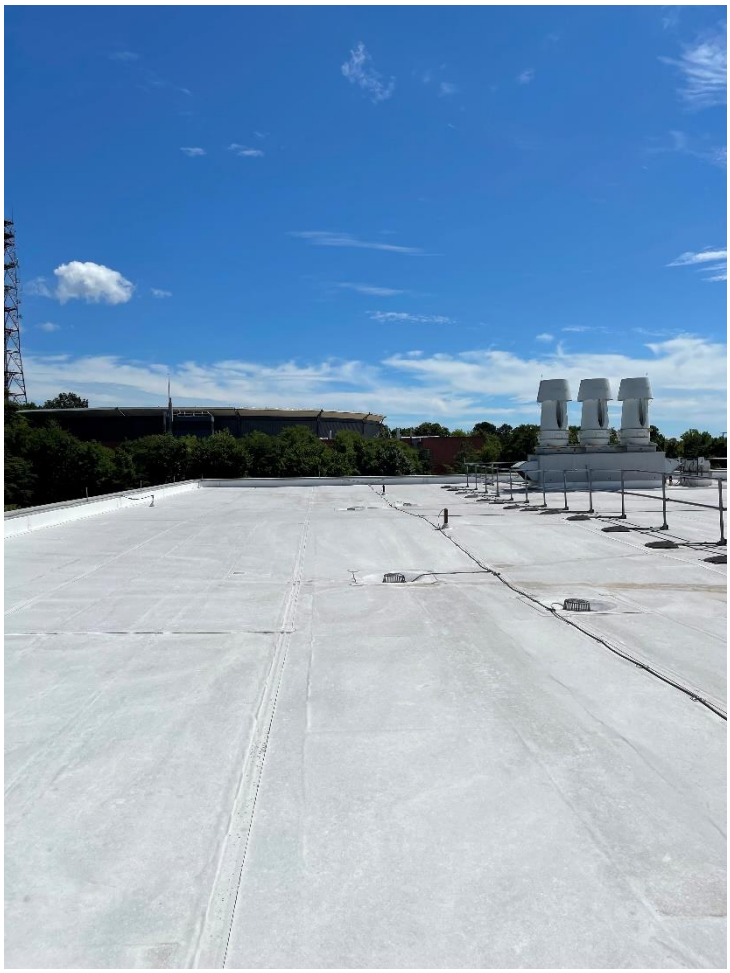

Photo #24: Equipment on the Mechanical Building

Photo #25: Equipment on the Mechanical Building

Photo # 26: Equipment on the Mechanical Building

PART 2 - PRODUCTS (Not Applicable)
PART 3 - EXECUTION (Not Applicable)

END OF SECTION 022000

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. Wood blocking and nailers.

1.3 DEFINITIONS

A. Boards or Strips: Lumber of less than 38 mm actual (2 inches nominal) size in least dimension.

B. Dimension Lumber: Lumber of 38 mm actual (2 inches nominal) or greater size but less than 114 mm actual (5 inches nominal) size in least dimension.

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 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.
2. 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.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

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

1. Fire-retardant-treated wood.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

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. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 15 percent for 38-mm actual (2-inch nominal) thickness or less, 19 percent for more than 38-mm actual (2-inch nominal) thickness unless otherwise indicated.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: All wood materials used on this project shall comply 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 3.2 m (10.5 feet) beyond the centerline of the burners at any time during the test.

1. Treatment shall 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. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all miscellaneous carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

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

1. Blocking.
2. Nailers.

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

C. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:

1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
4. Eastern softwoods, No. 2 Common grade; NELMA.
5. Northern species, No. 2 Common grade; NLGA.
6. Western woods, Construction or No. 2 Common grade; WCLIB or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES AC58 ICC-ES AC193 or ICC-ES AC308 as appropriate for the substrate.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 738M and ASTM F 836M, Grade A1 or A4 (ASTM F 593 and ASTM F 594, Alloy Group 1 or 2).

2.5 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.6 mm (0.025 inch).

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 accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking as indicated and as required to support facing materials, flashing and trim.

C. Sort and select lumber so that natural characteristics do 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.

D. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
2. ICC-ES evaluation report for fastener.

E. Use type 304 stainless 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 PROTECTION

A. 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 070150.19 - PREPARATION FOR REROOFING

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. Relocation and Reinstallation of existing fall protection System
2. Tear-off of roof areas indicated on Drawings.
3. Re-cover preparation of roof areas indicated on Drawings.
4. Removal of flashings and counterflashings.
5. Temporary roofing.

B. Related Requirements:

1. Division One for use of premises and for phasing requirements.
2. Division One for temporary construction and environmental-protection measures for reroofing preparation.
3. Division 26 “Electrical” for removal and protection of system components to be reinstalled after completion of roofing.

1.3 DEFINITIONS

A. EPS: Molded (expanded) polystyrene.

B. Full Roof Tear-off: Removal of existing roofing system down to existing roof deck.

C. Partial Roof Tear-off: Removal of existing roofing system down to existing sound rubberized asphalt sheet membrane (RASM).

D. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1. Meet with COTR, testing and inspecting agency representative, roofing 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 tear-off, including, but not limited to, the following:

    a. Reroofing preparation, including roofing system manufacturer's written instructions.
    b. Temporary protection requirements for existing roofing system components that are to remain.
    c. Existing roof drains and roof drainage during each stage of reroofing, and roof-drain plugging and plug removal.
    d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
    e. Existing roof deck conditions requiring COTR notification.
    f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
    g. Structural loading limitations of roof deck during reroofing.
    h. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect reroofing.
    i. HVAC shutdown and sealing of air intakes.
    j. Existing conditions that may require COTR notification before proceeding.

1.5 ACTION SUBMITTALS

A. Temporary Roofing Submittal: Description of materials and methods proposed to protect areas of roof removal and seal temporary roofing to areas of existing and new roofing.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field Test Reports:

C. Photographs: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations.

1. Submit before Work begins.

D. Landfill Records: Indicate receipt and acceptance of demolished roofing materials by a landfill facility licensed to accept them.

1.7 CLOSEOUT SUBMITTALS

A. Certified statement from the roofing manufacturer stating that existing roof warranty for other areas has not been affected by Work of the project.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with governing EPA notification regulations before beginning roofing removal.
2. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.9 FIELD CONDITIONS

A. Existing Roofing System: Single ply, loose laid, CSPE membrane roofing.

B. Smithsonian will occupy all portions of building immediately below reroofing area.

1. Conduct reroofing so Smithsonian's operations are not disrupted.
2. Provide COTR with not less than 7 days written notice of activities that may affect Smithsonian's operations.
3. Coordinate work activities daily with COTR so Smithsonian has 72 hours advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, and to shut down HVAC and fire-alarm or detection equipment if needed.
4. Provide 7 days advance notice if the work will require relocation of Smithsonian employees or equipment.
5. If structurally impaired areas of the deck are discovered during the work, notify COTR immediately. Before working over structurally impaired areas of deck, notify COTR to evacuate occupants from below affected area.

a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Smithsonian as far as practical.

F. Limit construction loads on existing roof areas to remain, and existing roof areas scheduled to be reroofed to 30 pounds per square foot for uniformly distributed loads.

G. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

H. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify COTR.

1.10 WARRANTY

A. Existing Warranties: Protect adjacent existing roofs to remain by methods and with materials so as not to void existing roofing system warranties.

1. Notify warrantor before proceeding with any Work impacting existing roofs.
2. Notify warrantor of existing roofing system on completion of reroofing, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect.

a. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. EPS Insulation: ASTM C 578.

B. Plywood: DOC PS 1, Grade CD, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

A. Provide design and selection of materials for temporary roofing.

2.3 INFILL AND REPLACEMENT MATERIALS

A. Infill materials for vapor barrier are specified in section 075600 – Fluid-Applied Polymethacrylate (PMA) Roofing.

B. Wood blocking, curbs, and nailers are specified in Section 061053 Miscellaneous Rough Carpentry."

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not store materials on existing roofs to remain.
2. Protect existing roofing system that is not to be reroofed when adjacent to the work.

3. Do not allow foot or wheeled construction traffic on existing roofs to remain except where no other access to work is possible.
4. Loosely lay 1-inch- (25-mm-) minimum thick, EPS insulation over existing roofing in areas to be protected or used as access. Provide plywood over EPS.
5. Limit traffic to areas of existing roofing that have been protected.
6. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
7. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Provide photographic documentation of all items indicated to be removed and reinstalled, showing their existing locations, condition and details.

C. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

D. Shut off rooftop utilities and service piping before beginning the Work.

E. Test existing roof drains to verify that they are not blocked or restricted.

1. Immediately notify COTR of any blockages or restrictions.

F. Remove, salvage and protect items indicated to be removed and reinstalled.
1. Relocation and Reinstallation of existing Fall protection System.
    a. Photo document the existing system before relocation.
    b. Remove the components in a manner that does not damage them.
    c. Store them safely away from the roofing activities.
    d. After the reroofing work is complete, reinstall them in the same location and position they were in before the relocation.
    e. Reinstall according to the Manufacture’s instructions, including, but not limited to, torquing the set screw to 29lbs.
    f. Notify the COTR when the work is complete. The reinstallation will be inspected by a manufacturer’s representative.
    g. Make corrections to the reinstallation as noted by the manufacturer’s representative.

G. Coordinate with COTR to shut down air-intake equipment in the vicinity of the Work.

1. After shutdown, cover air-intake louvers with solid barriers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork despite shutdown.

H. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

I. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

1. Prevent debris from entering or blocking roof drains and conductors.

    a. Use roof-drain plugs specifically designed for this purpose.
    b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

    a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Notify COTR each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Remove pavers and accessories from roofing.

1. Store and protect pavers and accessories indicated to be reused in manner not to exceed structural loading limitations of roof deck.
2. Discard cracked pavers.

D. Partial Roof Tear-off: Where indicated on Drawings, remove existing roofing and other roofing system components down to the existing rubberized asphalt sheet membrane (RASM). Protect RASM.

1. Remove single ply membrane.
2. Remove roof insulation and cover board.
3. Remove base flashings and counter flashings.
4. Remove perimeter edge flashing and gravel stops.
5. Remove copings.
6. Remove expansion-joint covers.
7. Remove flashings at pipes, curbs, mechanical equipment, and other penetrations.
8. Remove wood blocking, curbs, and nailers where indicated to be removed.
9. Remove roofing fasteners from deck.

3.3 DECK PREPARATION AT CONCRETE DECKS

A. Inspect deck after tear-off of roofing system in presence of COTR and third-party inspector.

B. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify COTR.

1. Do not proceed with installation until directed by COTR.

3.4 DECK PREPARATION AT METAL DECKS

A. Inspect deck after tear-off of roofing system in presence of COTR and third-party inspector. Determine during inspection if any areas of the existing deck are unsuitable for receiving new roof assembly.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify COTR.

1. Do not proceed with installation until directed by COTR

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify COTR.

1. Do not proceed with installation until directed by COTR.

3.5 TEMPORARY ROOFING

A. Install approved temporary roofing over area to be reroofed.

PRODUCT DATA SHEET 1 - REROOFING PREPARATION.

3.1 Verify that existing substrate is dry.

A. Spot check substrates with an electrical capacitance moisture-detection meter.

3.2 BASE FLASHING REMOVAL

A. Remove existing base flashings.

1. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.

B. Do not damage metal counterflashings that are indicated to remain.

1. Replace metal counterflashings indicated to remain if damaged during removal with counterflashings of metal specified in Section 076200 "Sheet Metal Flashing and Trim."

C. Where blocking and nailers may be discovered as rotted or deteriorated. Notify COTR and quantify the extent. Do not recover over deteriorated materials. Replace wood to comply with Section 061053 Miscellaneous Rough Carpentry."

3.3 ADHESIVE TESTING

A. Perform adhesive tests to determine adhesion of insulation to vapor barrier and other applicable substrates using specified adhesives, and submit test report to COTR and roofing manufacturer before installing new roofing system. Perform tests in presence of COTR and third-party roofing inspector.

1. Obtain roofing manufacturer's approval to proceed.

3.4 DISPOSAL

A. Collect and dispose of waste materials in accordance with specification section 010000.

END OF SECTION 070150.19

SECTION 075600 – FLUID-APPLIED POLYMETHACRYLATE 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. Fabric-reinforced, cold fluid-applied polymethacrylate (PMA) or polymethl methacrylate (PMMA) roofing.
2. Fabric-reinforced, cold fluid-applied polymethacrylate (PMA) or polymethl methacrylate (PMMA) flashing.
3. Sanded self-adhered SBS-modified base ply.
4. Cover board.
5. Roof insulation.
6. Self-adhered rubberized asphalt vapor.
7. Walkway Pads.

B. Related Requirements:

1. Section 070150.19 “Preparation for Reroofing” for removal of existing roofing system.

2. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers and blocking.
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings, counterflashings, and copings.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
5. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

B. RASM: Rubberized Asphalt Sheet Membrane.

1.4 PREINSTALLATION MEETINGS

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

1. Meet with COTR, testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, 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 affects roofing system.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane terminations.
3. Flashing details at penetrations.
4. Tapered insulation, including slopes.
5. Crickets, saddles, and tapered edge strips, including slopes.

C. Samples for Verification: For the following products:

1. Fabric-reinforced fluid-applied membrane with top coat: provide layered sample showing each layer of assembly in specified color.
2. Fabric reinforced fluid-applied flashing membrane with top coat: provide layered sample showing each layer of assembly, in specified color.
3. Self-adhered SBS base sheet.
4. Roofing insulation.
5. Self-adhered rubberized asphalt vapor barrier
6. Walkway Pads: Samples of specified color.

D. Wind Uplift Resistance Submittal: For roofing system indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

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

D. Field quality-control reports.

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

1.7 CLOSEOUT SUBMITTALS

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

B. Certified statement from existing roof membrane manufacturer stating that existing roof warranties on adjacent roofs has not been affected by Work performed under this Section.

1.8 QUALITY ASSURANCE

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

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

1. Installing firm must have installed at least 50 squares of PMA or PMMA roofing during the last 4 years.

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.

1. Protect stored liquid material from direct sunlight.
2. 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.

1. Store in a dry location.
2. 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.

E. Store flammable liquids at least ten meters from the building. Do not leave flammable liquids on the roof overnight or when the Contractor is not present.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, cover boards, and other components of roofing system.
2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, cover boards, and walkway products, for the following warranty period:

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and 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. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D 3746/D 3746M, ASTM D 4272/D 4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): 1.53 kPa/sq. m (31.95 lbf/sq. ft.).
2. Zone 2 (Roof Area Perimeter): 2.39 **kPa**/sq. m (49.92 lbf/sq. ft.).

    a. Location: From roof edge to 3.65 M (12 ft.) inside roof edge.

3. Zone 3 (Roof Area Corners): 3.26 kPa/sq. m (68.09 lb./sq. ft.).

    a. Location: 7.31 M (24 ft.) in each direction from each building corner.

D. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.80 and an emissivity of not less than 0.80 when tested according to CRRC-1.

E. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency.

1. Identify products with appropriate markings of applicable testing agency.

2.2 MANUFACTURERS

A. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturer approved by roof membrane manufacturer.

2.3 LIQUID-APPLIED FIELD MEMBRANE

A. Liquid-Applied Polymethacrylate (PMA) or Polymethyl-methacrylate (PMMA) Field Membrane: Low odor, rapid curing, polymethacrylate (PMA) or Polymethyl-methacrylate (PMMA) liquid resin with an embedded polyester reinforcement fabric used for monolithic waterproofing field membranes.

1. VOC content: 1.7 g/L maximum.
2. Color: White.
3. Elongation at peak load, avg. (ASTM D412): 54%.
4. Peak load at 73°F, avg. (ASTM D412): 799 lbf/in^2.
5. Tear strength (ASTM D 5147): 98 lbf.
6. Shore A hardness, avg. (ASTM D2240): 78
7. Water absorption (Method I, 24h@73°F) (ASTM D570): 0.44% maximum.
8. Water absorption (Method I, 48h@122°F) (ASTM D570): 1.40% maximum.
9. Low temperature flexibility (ASTM D5147): 14°F.
10. Dimensional stability (ASTM D5147): -0.19%.

B. Products:

1. Basis of Design Product: “Soprema Aslan RS 260 Lo Field.”
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

a. Johns Manville (www.jm.com)

2.4 LIQUID APPLIED TEXTURED FINISH COAT

A. Liquid Applied Quartz-Silica Textured PMMA Finish Coat: Rapid curing, polymethyl methacrylate (PMMA) admixture consisting of resin premixed with aggregate. Combine with a color pack for custom color traffic surfacing.

1. VOC content: 2.5 g/L maximum
2. Color: Clear
3. Custom color additive: VOC content: <5 g/L

B. Color: Traffic white.

C. Products:

1. Basis of Design Product: "Soprema Aslan RS 289 Textured Base."
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

a. Johns Manville (www.jm.com)

2.5 SELF-ADHERED BASE PLY FOR FIELD MEMBRANE AND FLASHING

A. Sanded Self-Adhered Base Ply: ASTM D 6164/D 6164M, Type I, Grade S, SBS-modified asphalt sheet, reinforced with non-woven polyester fabric.

1. Top Surface: fine mineral aggregate.
2. Bottom Surface: High tack self-adhesive layer with protective polyolefin release film for removal during installation.
3. Thickness: 2.7 mm min.

B. Products:

1. Basis of Design Product: "Soprema Sopralene Stick."
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

a. Johns Manville (www.jm.com)

2.6 SUBSTRATE BOARDS

A. Substrate Board: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, Type X, 13 mm thick.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening substrate board to roof deck.

2.7 COVER BOARD

A. Cover Board: Semi-rigid asphaltic roofing substrate board composed of a mineral-fortified asphaltic core formed between two fiberglass reinforcing plies.

1. Thickness: 6.4 mm (1/4")
2. Weight: 9.3 kg/sq meter (1.9 lb/sq. ft.)
3. Puncture Resistance: 445 N (100 lbf) per ASTM E154.
4. Water Absorption %: <1.0 per ASTM D994.
5. Compressive Strength: 9100 kPA (1320 psi) per ASTM C472, measured at 50% compression.
6. Hardness, min. 89N (20 lbf): Pass per ASTM C1278.

B. Products:

1. Basis of Design Product: "Soprema Sopraboard ¼."
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

a. Johns Manville (www.jm.com)
b. Siplast (www.siplast.com)

2.8 LIQUID-APPLIED FLASHING MEMBRANE

A. Liquid-Applied Polymethacrylate (PMA) or Polymethyl-methacrylate (PMMA) Flashing Membrane: Low odor, rapid curing, polymethacrylate (PMA) or polymethyl-methacrylate (PMMA) liquid resin with an embedded polyester reinforcement fabric recommended by manufacture for use as monolithic flashing membranes.

1. VOC content: 1.7 g/L maximum.
2. Color: White.

B. Products:

1. Basis of Design Product: "Soprema Aslan RS 260 Lo Flash."
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

a. Johns Manville (www.jm.com)

2.9 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesives and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Cylindrical Expansion Joint Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control membrane expansion joint profile and otherwise contribute to producing optimum membrane joint performance.

C. Prefabricated Flashings at lightning protection leads: As recommended by roof membrane manufacturer.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.

E. Miscellaneous Accessories: Provide those recommended by roofing system manufacturer.

F. Fabric Reinforcing: Woven polyester reinforcement used in PMMA/PMA liquid applied membrane and flashing applications.

1. Thickness: 30-40 mils (0.8-1 mm)
2. Weights: 110 g/m^2
3. Products:

a. Basis of Design Product: “Soprema Aslan RS Fleece.”
b. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design product, or an equivalent product by one of the following:

1) Johns Manville (www.jm.com)
2) Siplast (www.siplast.com)

G. Catalyst: Catalyst Powder by membrane manufacturer for use to cure PMMA/PMA liquid resins.

H. Paste and Mortar: Rapid curing PMMA or PMA paste resin recommended by roof membrane manufacturer for use in filling small cracks and voids in substrate prior to membrane application.

2.10 PRIMERS

A. General: Provide primers and cleaners recommended by the roof membrane manufacturer for each type of substrate to which the manufacturer’s adhesives or membrane materials will be applied.

2.11 VAPOR RETARDER

A. Self-adhered SBS-modified sheet meeting the requirements in this section for the “Self-Adhered Base Ply for Field Membrane and Flashing.”

2.12 ROOF INSULATION

A. General: Preformed roof insulation boards, manufactured or approved by roof membrane manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 3, felt or glass-fiber mat facer on both major surfaces.
1. Compressive Strength: 172 kPa (25 psi).
2. Size: 1219 by 1219 mm (48 by 48 inches).
3. Thickness:

a. Base Layer: 76 mm (3 inches).
b. Upper Layer: 76 mm (3 inches).

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 6 mm (1/4 inch).
3. Slope:
a. Saddles and Crickets: 1:24 (1/2 inch per foot) unless otherwise indicated on Drawings.

2.13 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

C. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

D. Wood Nailer Strips: Comply with requirements in Section 061053 "Miscellaneous Rough Carpentry."

E. Tapered Edge Strips: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board.

2.14 WALKWAYS

A. Walkway Pads: EPDM Rubber, manufactured as a traffic pad for foot traffic and acceptable to roofing system manufacturer, 9 mm (.375 inches) thick, minimum.

1. Pad Size: Approximately 750 mm by 750 mm (30 inches by 30 inches).
2. Color: White.

B. Products:

1. Basis of Design Product: Carlisle “SureWhite” EPDM pressure sensitive molded walkway pads.
2. Subject to compliance with requirements, products that may be incorporated into the work include, but are not limited to, the Basis of Design Product, or an equivalent product by another manufacturer.

PART 3 - EXECUTION

3.1 REMOVAL OF EXISTING ROOFING

A. See Specification Section 070150.19 “Preparation for Reroofing” for removal of existing roofing system.

3.2 EXAMINATION

A. Each day, before starting roofing work, perform moisture testing of substrate, in presence of COTR in each area where roofing materials will be applied that day. Demonstrate that moisture content of substrate complies with the recommendations of the manufacturers of the insulation adhesive and roofing system.

B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that deck is securely fastened with no projecting fasteners and with no adjacent units in excess of 1.6 mm (1/16 inch) out of plane relative to adjoining deck.

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

3.3 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions.

1. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

1. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Use of VOC containing Liquids: Notify COTR 72 hours in advance for each area of roof when VOC containing liquids will be used on the roof to give the Smithsonian time to coordinate the shutdown of air intakes in the area of work.

D. Each day prior to start of work, verify with the COTR that air intakes in and near the area of work have been shut down when VOC containing liquids will be used on the roof.

1. After shutdown of air intakes, cover air-intake louvers with solid barriers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork despite shutdown.

3.4 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.

1. Remove and discard temporary seals before beginning work on adjoining roofing.

C. Substrate-Joint Penetrations: Prevent adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.5 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 600 mm in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.
3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
4. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.

3.6 VAPOR RETARDER INSTALLATION

A. General: Provide new vapor barrier

B.

1. Over concrete deck and
2. substrate board installed on metal deck.

C. Self-Adhering SBS Modified Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side

and end lapping each sheet a minimum of 90 and 150 mm (3-1/2 and 6 inches), respectively. Lap 150 mm (6 inches) min. onto existing RASM.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of the insulation and cover board plus 2 inches.
2. Seal laps by rolling.

D. Completely seal vapor retarder at terminations, obstructions, joints, and penetrations to prevent air movement into roofing system.

3.7 INSULATION INSTALLATION

A. Coordinate installing roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 14 deg C (45 deg F).

D. Installation Over Metal Decking:

1. Install base layer of insulation with end joints staggered not less than 300 mm (12 inches) in adjacent rows and with long joints continuous at right angle to flutes of decking.

    a. Locate end joints over crests of decking.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 6 mm (1/4 inch) in width.
    d. Fill gaps exceeding 6 mm (1/4 inch) with insulation.
    e. Cut and fit insulation within 6 mm (1/4 inch) of projections, and penetrations.
    f. Adhere base layer of insulation to vapor retarder to provide specified wind uplift resistance and as follows:

        1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

2. Install upper layers of insulation, with joints of each layer offset not less than 300 mm (12 inches) from previous layer of insulation.

    a. Staggered end joints within each layer not less than 600 mm (24 inches) in adjacent rows.
    b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
    c. Make joints between adjacent insulation boards not more than 6 mm (1/4 inch) in width.
    d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 600 mm (24 inches).

e. Trim insulation, so that water flow is unrestricted.
f. Fill gaps exceeding 6 mm (1/4 inch) with insulation.
g. Cut and fit insulation within 6 mm (1/4 inch) of projections, and penetrations.
h. Adhere each layer of insulation to substrate using adhesive to provide specified wind uplift resistance and as follows:

1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

E. Installation Over Concrete Decks:

1. Install base layer of insulation with joints staggered not less than 600 mm (24 inches) in adjacent rows.

a. Make joints between adjacent insulation boards not more than 6 mm (1/4 inch) in width.
b. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 600 mm (24 inches).

1) Trim insulation, so that water flow is unrestricted.

c. Fill gaps exceeding 6 mm (1/4 inch) with insulation.
d. Cut and fit insulation within 6 mm (1/4 inch) of nailers, projections, and penetrations.
e. Adhere base layer of insulation to vapor retarder to provide specified wind uplift resistance and as follows:

1) Set insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

2. Install upper layers of insulation and tapered insulation, with joints of each layer offset not less than 300 mm (12 inches) from previous layer of insulation.

a. Staggered end joints within each layer not less than 600 mm (24 inches) in adjacent rows.
b. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
c. Make joints between adjacent insulation boards not more than 6 mm (1/4 inch) in width.
d. At internal roof drains, slope insulation to create a square drain sump, with each side equal to the diameter of the drain bowl plus 600 mm (24 inches).

1) Trim insulation, so that water flow is unrestricted.

e. Fill gaps exceeding 6 mm (1/4 inch) with insulation.
f. Cut and fit insulation within 6 mm (1/4 inch) of nailers, projections, and penetrations.
g. Adhere each layer of insulation to substrate using adhesive to provide specified wind uplift resistance and as follows:

1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 INSTALLATION OF COVER BOARDS

A. 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 150 mm (6 inches) in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

    a. Trim cover board, so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive to provide specified wind uplift resistance, as follows:

    a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.9 ROOFING MEMBRANE INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

B. Start installation of roofing in presence of roofing system manufacturer's technical personnel and Government’s testing and inspection agency.

C. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt, with joints and edges sealed.
2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.10 SELF-ADHERED BASE PLY INSTALLATION

A. Before installing, unroll base sheet, cut into workable lengths, and allow to lie flat for a time period recommended by manufacturer for the ambient temperature.

B. Prime cover board with primer recommended by manufacturer in accordance with manufacturer's written instructions.

C. Installation of SBS-Modified Bitumen Polyester-Mat Self-Adhered Base Sheet:

1. Install base sheet according to roofing manufacturer's written instructions, starting at low point of roofing system.
2. Extend roofing sheets over cants, completely up vertical surfaces and across top of parapets and curbs.
3. Install base ply in a shingle fashion.
4. Remove release backer from base ply sheets and adhere to cover boards and vertical surfaces.
5. Install base sheet without wrinkles, rears, and free from air pockets.
6. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps.

    a. Lap side laps as recommended by roof membrane manufacturer but not less than 76 mm (3 inches).
    b. Lap end laps as recommended by roof membrane manufacturer but not less than 300 mm (12 inches).
    c. Stagger end laps not less than 450 mm (18 inches).
    d. Completely bond and seal laps, leaving no voids.
    e. Roll laps with a 9-kg (20-pound) roller.

7. Repair tears and voids in laps and lapped seams not completely sealed.
8. Apply pressure to the body of the base sheet according to manufacturer's instructions, to remove air pockets and to result in complete adhesion of base sheet to substrate.

3.11 LIQUID-APPLIED FABRIC-REINFORCED FLASHING MEMBRANE INSTALLATION

A. General:

1. Refer to manufacturer's detail drawings, product data sheets and published general requirements for application rates and specific installation instructions.
2. Provide a minimum vertical height of 8 in (20 cm) for all flashing terminations wherever possible. Flashing height shall be at least as high as the potential water level that could be reached as a result of a deluging rain and/or poor slope.
3. Do not flash over existing through-wall flashings, weep holes and overflow scuppers.
4. All flashing shall be terminated as required by the manufacturer. See division 07 section "Sheet Metal Flashing and Trim" for copings and counterflashings.
5. Install all flashing membranes before installing field membranes.
6. The primed substrate shall be dry and free of any dust, loose particles or contaminants.
7. Precut reinforcing fleece to conform to terminations, transitions and penetrations being flashed. Ensure a minimum 2 in (5 cm) overlap of fleece at side laps and extend flashing 4 in (10 cm) minimum horizontally onto deck unless otherwise specified. Ensure the completed liquid applied flashing membrane is fully reinforced.
8. Mix flashing resin and catalyst approximately 2 minutes using a clean spiral agitator on slow speed or stir stick until evenly mixed. Do not aerate. Mix only the amount of flashing resin that can be used within the application time.

9. Apply the base coat of catalyzed waterproofing resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
10. Immediately apply the reinforcing fleece into the wet base coat of flashing resin making sure the smooth side is up. Using a brush or roller, work the reinforcing fabric into the wet resin while applying the second coat of catalyzed flashing resin to completely encapsulate the fleece. Avoid any folds and wrinkles.
11. At membrane tie-ins, clean cured membrane with specified cleaner before application of adjacent membrane.

B. Penetrations

1. Pipes, Conduits, Posts, Supports and Unusual Shaped Penetrations:

    a. Pipes, conduits and other items to be flashed must be separated with ½ in (1.3 cm) minimum clearance or as recommended by manufacturer to adequately waterproof each individual penetration.
    b. All penetrations must be flashed individually. Two or more items ganged together in a flashing will NOT be permitted.
    c. Flash penetrations using cold liquid applied fabric-reinforced membrane or proprietary fibrated flashing resin as recommended by membrane manufacturer. Provide reinforced deck skirt/target flashing applied over a reinforced vertical wrap finger flashing.

C. Drains:

1. Flash drains using cold liquid applied flashing membrane. Flash with a membrane target extending minimum 12 in (30 cm) horizontally onto the substrate applied over a finger flashing extended into the prepared drain bowl a minimum of 3 in (7.5 cm).
2. Do not restrict or reduce the drain inlet in size.

D. Hot Pipes:

1. Protect cold liquid applied membrane components from direct contact with steam or heat sources when the in-service temperature exceeds 150°F (65.5°C). In all such cases flash to an intermediate "cool" sleeve.
2. Fabricate "cool" sleeve in the form of a metal cone using non-ferrous metal in accordance with manufacturer details.
3. Flash sleeve using cold liquid applied reinforced membrane similar to a standard pipe flashing. Flash using a reinforced target applied over a reinforced vertical wrap finger flashing.

E. Flexible Penetrations:

1. Provide a weather-tight gooseneck set in manufacturers resin paste and secured to the deck.
2. Flash gooseneck penetrations using cold liquid applied reinforced membrane as recommended. Flash with a reinforced target and reinforced vertical wrap finger flashing.

F. Walls, Curbs and Bases:

1. Flash all walls, curbs and bases using cold liquid-applied fabric-reinforced flashing membrane. Wherever possible extend flashing up and over tops of walls, curbs and bases so the membrane terminates on the opposite face of the vertical element.

G. Expansion Joints:

1. Flash all expansion joints with minimum two layers of manufacturer's cold liquid-applied fabric-reinforced membrane applied over an expansion joint compressible filler, expansion tube, backer rod as recommended by manufacturer.

H. Non-standard Flashing Details: When required, consult manufacturer for recommendations on flashing non-standard conditions, penetrations or protrusions.

I. Roof Drains:

1. Flash drains in accordance with Contract Documents and manufacturer's written instructions.
2. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.
3. Install stripping according to roofing system manufacturer's written instructions.

3.12 LIQUID-APPLIED FABRIC-REINFORCED FIELD MEMBRANE INSTALLATION

A. Refer to manufacturer's detail drawings, product data sheets and published general requirements for application rates and specific installation instructions.

B. Install all flashing membranes before installing field membranes.

C. The primed substrate shall be dry and free of any dust, loose particles or contaminants.

D. Precut reinforcing fleece to conform to terminations, transitions and penetrations being flashed. Ensure a minimum 2 in (5 cm) overlap of fleece at side and 4 in (10 cm) at end-laps. Ensure the completed liquid applied membrane is fully reinforced.

E. Mix field membrane resin and catalyst approximately 2 minutes using a clean spiral agitator on slow speed or stir stick until evenly mixed. Do not aerate. Mix only the amount of product that can be used within the application time.

F. Apply the base coat of catalyzed field membrane resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.

G. Immediately apply the reinforcing fleece into the wet base coat of field membrane resin making sure the smooth side is up. Using a brush or roller, work the reinforcing fabric into the wet resin while applying the second coat of catalyzed field membrane resin to completely encapsulate the fleece. Avoid any folds and wrinkles.

H. At membrane tie-ins, clean cured membrane with specified cleaner before application of adjacent membrane.

3.13 LIQUID APPLIED TEXTURED FINISH COAT INSTALLATION

A. Preparation: Prior to applying surfacing or finish, contractor conduct a complete evaluation of the installed liquid applied waterproofing membrane and flashings including visual inspection of all membrane areas and 24-hour water flood testing at drains.

1. Immediately following evaluation and testing, repair all deficiencies identified in liquid applied waterproofing membrane and flashings.
2. Upon satisfactory completion of all required repairs, proceed with application of finish layers.

B. General: Provide roofing membrane manufacturer's textured resin finish with integrally mixed aggregate to create a highly slip-resistant wearing surface. Apply to field membrane and flashing membranes.

C. Apply an even topcoat of pigmented textured finish resin using a flat or V-notched trowel at minimum recommended consumption. Use an appropriate roller to remove excess resin or puddling. Roll textured finish resin in one direction, then roll in the cross direction to obtain a uniform finish.

1. Refer to manufacturer's detail drawings, product data sheets and published general requirements for application rates and specific installation instructions.
2. Install surfacing and finish layers over fully cured membrane layer.
3. The substrate shall be dry and free of any dust, loose particles or contaminants.
4. Mix resins using a slow speed agitator prior to pouring into a larger container.
5. Mix surfacing or finish resins with catalyst approximately 2 minutes using a clean spiral agitator on slow speed or stir stick until evenly mixed. Do not aerate. Mix only the amount of product that can be used within the application time.
6. Apply the catalyzed surfacing or finish resin onto the substrate as recommended, working the material into the surface for complete coverage and full adhesion.
7. At tie-ins and previously applied membrane, clean cured surface with specified cleaner before application of subsequent resin materials.

3.14 WALKWAY INSTALLATION

A. Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size, according to walkway pad manufacturer's written instructions.

1. Install walkways at the following locations:

    a. Locations indicated on drawings.
    b. Top and bottom of each roof access ladder.
    c. Under all concrete pavers and pads.
    d. Under all fall protection railing counterweights.
    e. Where required by roof membrane manufacturer's warranty requirements.

2. Provide 76-mm (3-inch) clearance between adjoining pads.
3. Adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.15 FIELD QUALITY CONTROL

A. Provide continuous access to the work to the COTR and the Smithsonian's third-party roofing inspector.

B. Provide visits to the site by a technical representative of the roofing system manufacturer to provide progress inspections to evaluate membrane and flashing installation. Notify COTR of the day and time of the representative's visits.

1. Frequency of Visits: During the first 3 months of work on the roof, provide weekly visits by the technical representative of the roofing system manufacturer. After three months of work, provide visits at least once every three weeks.

C. Perform the following tests:

1. Flood Testing: Flood each drain and surrounding sump area for leaks, according to recommendations in ASTM D 5957, after completing roofing and flashing but before overlying construction is placed. Install temporary containment assemblies, plug or dam drains, and flood with potable water.

a. Flood to an average depth of 65 mm (2-1/2 inches) with a minimum depth of 25 mm (1 inch) and not exceeding a depth of 200 mm (8 inches). Maintain 51 mm (2 inches) of clearance from top of base flashing.
b. Flood each area for 24 hours.
c. After flood testing, repair leaks, repeat flood tests, and make further repairs until roofing and flashing installations are watertight.

1) Cost of retesting is the responsibility of the Contractor.

2. Tensile Bond Test: Provide qualitative bond testing in the field of the following, in accordance with roof system manufacturer's recommendations. Provide testing at least once every 500 sq. meters (5382 sq. ft.) of roofing, but not less than 3 times for smaller areas of roof. Provide additional testing whenever application temperatures vary significantly from previous tests. Perform testing in the presence of the COTR or third-party inspector.

a. Base layer of insulation to substrate.
b. Insulation to previous insulation layer.
c. Cover board to insulation.
d. Base Ply to cover board.
e. Membrane to Base ply

D. Test Cuts: Remove test specimens to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:

1. Determine approximate quantities of components within roofing membrane according to ASTM D 3617/D 3617M.
2. Examine test specimens for interply voids according to ASTM D 3617/D 3617M and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

3. Repair areas where test cuts were made according to roofing system manufacturer's written instructions.

E. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of COTR, and Architect, and to prepare inspection report.

1. Notify COTR 48 hours in advance of date and time of inspection.

F. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

G. Roofing 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 if replaced or additional work complies with specified requirements.

3.16 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Uncured resin is considered a hazardous material. Catalyze and cure unused resin prior to disposal.

D. Clean up and properly dispose of waste and debris resulting from construction operations each day as required to prevent damages and disruptions to operations.

E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.17 ROOFING INSTALLER'S WARRANTY

A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: Smithsonian Institution.
2. Address: 600 Maryland Ave. SW, Washington DC 20560.
3. Building Name/Type: Museum Support Center.
4. Address: 4210 Silver Hill Road, Suitland MD 20560.
5. Area of Work: Roofs of Pods 1, 2, and 4, and the street and node roofs.
6. Acceptance Date: _____.
7. Warranty Period: 20 years.
8. Expiration Date: _____.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing 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.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. lightning;
    b. peak gust wind speed exceeding 51.40 meters per second (115 miles per hour);
    c. fire;
    d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. vapor condensation on bottom of roofing; and
    g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 075216

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. Formed low-slope roof sheet metal fabrications.
2. Formed wall sheet metal fabrications.
3. Formed equipment support flashing.
4. Sheet Metal Copings

B. Related Requirements:

1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

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

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.

5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of roof-penetration flashing.
7. Include details of edge conditions, including copings, edge trim, and counterflashings as applicable.
8. Include details of special conditions.
9. Include details of connections to adjoining work.
10. Detail formed flashing and trim at scale of not less than 1:5 (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. Counter Flashing: 300 mm (12 inches) long by actual width of unit, in required profile. Include fasteners, cleats, clips, and other attachments.
2. Aluminum Coping: 300 mm (12 inches) long and in required profile. Include fasteners, and concealed cleats.
3. Finished Aluminum Samples: Samples to show full range to be expected for each color required.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing and trim, and its accessories, to include in maintenance manuals.

1.7 QUALITY ASSURANCE

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

1. For copings and roof edge flashings that are FM Approvals approved, shop shall be listed as able to fabricate required details as tested and approved.

B. 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 parapet with coping approximately 3.0 m (10 feet) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.

2. Build mockup of typical base flashing with sheet metal counterflashing approximately 3.0 m (10 feet) long, including supporting construction cleats, seams, attachments, underlayment, and accessories.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless COTR specifically approves such deviations in writing.
4. 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. 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.

1.9 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: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1 and capable of resisting the following design pressure:

1. Corner Uplift Pressure: 3.26 kPa (68 psf)
2. Perimeter Uplift Pressure: 2.39 kPa (49 psf)

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: 67 deg C (120 deg F), ambient; 100 deg C (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 209M (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. Two-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Color: Match recently installed existing flashing on Office roof areas. Recently installed flashing to match is Firestone ‘UnaClad” aluminum sheet with Kynar 500/Hylar 5000 finish in “Sandstone” color.
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 0.013 mm (0.5 mil).

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed; with smooth, flat surface.

1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 0.76 mm (30 mils) thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 116 deg C (240 deg F) or higher.
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 29 deg C (20 deg F) or lower.

B. Slip Sheet: Rosin-sized building paper, 0.16 kg/sq. m (3 lb./100 sq. ft.) minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal 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.

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. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 13 mm (1/2 inch) wide and 3 mm (1/8 inch) thick.

D. 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.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without 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. 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 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines indicated on Drawings and within 3-mm (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.

1. Form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 inch) deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only.

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. Rivet joints where necessary for strength.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Roof Edge Flashing: Fabricate in minimum 2400-mm- (96-inch-) long, but not exceeding 3.6-m- (12-foot-) long sections. Furnish with 150-mm- (6-inch-) wide, joint cover plates.

1. Joint Style: Overlapped 100 mm (4.0 inches).
2. Fabricate from the Following Materials:

a. Aluminum: 1.02 mm (0.040 inch) thick.

B. Copings: Fabricate in minimum 2400-mm- (96-inch-) long, but not exceeding 3.6-m- (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, watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: As indicated, according to SMACNA's "Architectural Sheet Metal Manual."
2. Joint Style: Butted with expansion space and 150-mm- (6-inch-) wide, exposed cover plate.
3. Fabricate from the Following Materials:

    a. Aluminum: 1.02 mm (0.040 inch) thick.

C. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Unless otherwise noted, provide counterflashings of Aluminum: 1.02 mm (0.040 inch) thick.

2. At equipment support curbs, duct curbs, and hatch curbs provide counterflashings of Stainless Steel: 0.48 mm (0.019 inch) thick.

D. Flashing Receivers: Fabricate from the following materials:

1. At two-piece stainless steel counterflashing, fabricate of Stainless Steel: 0.48 mm (0.019 inch) thick.

2.7 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following materials:

1. Stainless Steel: 0.48 mm (0.019 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.

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 150 mm (6 inches) staggered 600 mm (24 inches) between courses. Overlap side edges not less than 90 mm (3-1/2 inches). Roll laps and edges with roller. Cover underlayment within 14 days.

1. Underlayment may be omitted where self-adhered roofing base ply extends completely under area where flashing is to be installed.

B. Apply slip sheet, wrinkle free, over underlayment (or roofing base ply) before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, 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. Place cleats continuously as shown. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim with no 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 permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim, 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 3 m (10 feet) with no joints within 600 mm (24 inches) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 25 mm (1 inch) deep, filled with sealant concealed within joints.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 32 mm (1-1/4 inches) for nails and not less than 19 mm (3/4 inch) for wood screws.

E. Conceal fasteners and expansion provisions 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. Embed hooked flanges of joint members not less than 25 mm (1 inch) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 4 and 21 deg C (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 4 deg C (40 deg F).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

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: Remove and Replace existing as shown.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 400-mm (16-inch) centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 600-mm (24-inch) centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in receivers and fit tightly to base flashing. Extend counterflashing 100 mm (4 inches) over base flashing. Lap counterflashing joints minimum of 100 mm (4 inches). Secure in waterproof manner by means of anchor and washer at 910-mm (36-inch) centers unless otherwise indicated.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines indicated on Drawings and within 3-mm (1/8-inch) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess sealants.

C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of 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.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

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.

B. Section 079200_Sheet Metal Flashing and Trim

1.2 SUMMARY

A. Section Includes:

1. Nonstaining silicone joint sealants.
2. Urethane joint sealants.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. 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.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

C. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates, including finished sheet metals as follows:

1. Locate test joints where directed by COTR.
2. Conduct field tests for each kind of sealant and joint substrate.
3. Notify COTR seven days in advance of dates and times when test joints will be erected.
4. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    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.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 5 deg C (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.

1.8 WARRANTY

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

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

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

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

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

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

2.2 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.

2.3 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.

2.4 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 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 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.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

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

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Joints between metal panels.
b. Joints between different materials.
c. Perimeter joints and frames of doors windows and louvers.
d. Other joints as indicated.

2. Joint Sealant: Silicone, nonstaining, S, NS, 50, NT.
3. Joint-Sealant Color: As selected by COTR from manufacturer's full range of colors.

B. Joint-Sealant Application: Concealed mastics.

1. Joint Locations:

a. Other joints as indicated.

2. Joint Sealant: Butyl-rubber based.

END OF SECTION 079200

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Replacement Type Metal roof drains.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Stainless Steel, Replacement Type Roof Drains:

1. Basis of Design Product: RD2150 Replacement Roof Drain by Zurn.

    a. Subject to compliance with requirements, products that may be incorporated into the work include the Basis of Design Product or a similar product by another manufacturer.

2. Body Material: Type 304 Stainless Steel. #16 gage min.
3. Dimension of Body: Nominal 315- to 350-mm (12-1/2-to 14-inch) diameter.
4. Outlet: Bottom, sized to seal inside existing roof drain outlets.
5. Outlet Type: Stainless steel outlet pipe with neoprene gaskets for sealing inside of existing pipe. Verify size of existing roof drain pipe and coordinate with outlet size.
6. Extension Collars: Not required.
7. Underdeck Clamp: Not required.
8. Sump Receiver Plate: Required.

9. Dome Material: Coated Cast iron clamp and dome, with stainless steel hardware.
10. Vandal-Proof Dome: Not required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at existing drain locations according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.

3.2 FLASHING INSTALLATION

A. Flash as indicated and as recommended by roof membrane manufacturer.

B. Secure flashing into sleeve and specialty clamping ring or device.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

END OF SECTION 221423

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof hatches.

B. Related Requirements:
   1. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
   2. Section 077100 "Roof Specialties" for manufactured fasciae, copings, gravel stops, gutters and downspouts, and counterflashing.

1.2 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with existing roof curb to remain.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories.

   1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, and special conditions. Distinguish between plant- and field-assembled work.

C. Delegated Design Submittals: For roof curbs and walkways 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. Detail mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
   2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Required clearances.

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

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.6 WARRANTY

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 ROOF HATCHES

A. Roof Hatches: Metal roof-hatch units with lids and insulated double-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, straight sides, and integrally formed deck-mounting flange at perimeter bottom.

B. Basis-of-Design Product: Subject to compliance with requirements, provide ACUDOR Products Inc.; Electrical Actuation;; Roof Hatch or comparable product by one of the following:

1. Custom Solution Roof and Metal Products.
2. Milcor; Commercial Products Group of Hart & Cooley, Inc.
3. Precision Ladders, LLC.

C. Type and Size:

1. Single-leaf lid, to match existing curb dimensions.

D. Loads: Minimum 40-lbf/sq. ft. (1.9-kPa) external live load and 20-lbf/sq. ft. (0.95-kPa) internal uplift load.

E. Hatch Material, Aluminum:

1. Thickness: Manufacturer's standard thickness for hatch size indicated.
2. Finish: Mill.

F. Construction:

1. Insulation: 2-inch- (50-mm-) thick, polyisocyanurate board.

   a. R-Value: 12.0 according to ASTM C1363.

2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: Opaque, insulated, and double walled, with manufacturer's standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.

G. Hardware: Spring operators, hold-open arm, stainless steel spring latch with turn handles, stainless steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide remote-control operation.

H. Safety Railing System: Remove store and reinstall safety barrier and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.

2.3 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

E. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A153/A153M or ASTM F2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

F. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

G. Elastomeric Sealant: ASTM C920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

H. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

I. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.4 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 substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level; plumb; true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum stainless steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of underlayment and cover with manufacturer's recommended slip sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb: reuse existing

D. Roof-Hatch Installation:

1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
2. Attach safety railing system to roof-hatch curb.

E. Seal joints with sealant as required by roof accessory manufacturer.

3.3 REPAIR AND CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions.

B. Clean off excess sealants.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077200

SECTION 260101 - ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General provisions and requirements for electrical work.

1.2 RELATED SECTIONS

A. Requirements of this section generally supplement requirements of Division 01.

1.3 REFERENCES

A. NFPA 10: Portable Fire Extinguishers.

B. NFPA 241: Safeguarding Construction, Alteration, and Demolition Operations.

1.4 SYSTEM DESCRIPTION

A. The full set of Contract Documents applies to work of Division 26.

B. Visit the site and study aspects of the project and working conditions, as required by General and Supplementary Conditions, Bidding and Contracting Requirements, Drawings, and Specifications. Verify field dimensions.

C. The work covered in technical sections includes the furnishing of labor, equipment and materials, and the performance of operations pertinent to the work described.

D. Except as required otherwise in Division 01, promptly obtain and pay for necessary signatures and paperwork, permits, fees and inspections required for work of this division by authorities having jurisdiction, including any utility connection or extension charge. No payment will be made until a copy of the permit is forwarded to the COTR.

E. Electrical work of this project includes, as a brief general description, the following:

1. Removal of those portions of the existing lightning protection system that impede installation of a new roof.
2. Provision of new portions of the lightning protection system as needed to obtain a UL Master Certification for the lightning protection system at the end of the project.
3. Temporary electrical work as needed to facilitate relocation of roof-mounted equipment, so as to allow the roof to be replaced.

F. See Division 01 for requirements related to Owner’s occupancy of the premises, limits on use of site, time restrictions on work, limits on utility outages or shutdowns, and phasing (sequencing) and scheduling.

1.5 PRODUCT OPTIONS

A. Except as modified by provisions of Bidding and Contracting Requirements and Division 01, these options apply to Division 26 specifications.

B. General: Where Contractor is permitted to use a product other than the specified item and model named as the basis of design, Contractor is responsible for coordination and additional costs as specified in article “Substitutions” below for substitutions.

C. Products specified by reference standards or by description only: Any product meeting those standards or description.

D. Products specified by naming one or more manufacturers, or model name or catalog reference number: Products specified establish a standard of quality, options to be included, and performance.

1. Where other acceptable manufacturers are named, Contractor may provide products of those named manufacturers only, which meet the specifications.
2. Where specification permits “equal” products, without naming other acceptable manufacturers, Contractor may use products of any manufacturer, which meet the specifications.

E. Products specified by naming one or more manufacturers, or model name or catalog reference number: Products specified establish a standard of quality, options to be included, and performance, and shall not be construed as limiting competition. Contractor may use products of any manufacturer, which meet the specifications.

F. Products specified by naming one manufacturer and particular product, with no provision for other options: No options or substitutions allowed.

1.6 SUBSTITUTIONS

A. Substitutions will be considered only as permitted or required by the Bidding and Contracting Requirements and Division 01. Except as modified by those requirements, the requirements below apply to Division 26 specifications.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed substitution with contract documents.

D. A request constitutes a representation that the Bidder or Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.

5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution submittal procedure is specified in Bidding and Contracting Requirements and Division 01.

1.7 MATERIALS AND EQUIPMENT

A. Materials and equipment shall be new and the best of their respective kinds, suitable for the conditions and duties imposed on them by the project, and of representative manufacturer. The description, characteristics and requirements of the materials to be used shall be in accordance with the specifications.

B. Equipment, construction and installation must meet requirements of local, state and federal governing codes.

C. Singular number: In cases where material, a device, or part of the equipment is referred to in the singular number in the specifications, it is intended that such reference shall apply to as many items of material, devices, or parts of the equipment as are required to complete the installation as shown on the drawings or required for proper operation of the system.

D. Terms have the following meanings:

1. Furnish: Supply item
2. Install: Mount and connect item
3. Provide: Furnish and install

E. Materials and equipment shall be installed and completed in a first class and professional manner and in accordance with the best modern methods, practice and manufacturers' instructions. Any work which shall not present an orderly and neat or professional appearance shall be removed and replaced with satisfactory work when so directed in writing by the COTR.

F. The specifications and drawings are intended to define the minimum requirements, as to quality of materials, construction, finish and overall artisanry.

G. General Conditions describe the correlation and intent of the Contract Documents. In case of discrepancies between the specifications and drawings, the specifications should be followed as to the general methods and principles and the drawings followed as to sizes, capacities and specifics for corresponding parts. If sizes are omitted, the COTR will determine sizes to be utilized.

H. In cases of doubt, uncertainty, or conflict as to the true meaning of the specifications or drawings, it is the responsibility of the Contractor to notify the COTR of said uncertainty, doubt, or conflict and obtain a decision as to the intent prior to initiating any work which may be affected by this decision.

1.8 COORDINATION

A. Should a situation develop during construction to prevent the proper installation of any equipment or item where shown on the drawings, call the situation to the attention of the COTR and await a written decision.

B. Plan and coordinate work to proceed in an orderly and continuous manner without undue delay, and in conformance with the project schedule. Submit samples, shop drawings, schedules, insurance policies and certificates, and the like in time to avoid delays in actual construction. Coordinate electrical work so that work of each trade is completed before other construction begins which would obstruct it.

C. Coordinate trades to ensure that proper clearances between work of the various trades allow access to items which require operation and maintenance.

D. Coordinate location and elevation of conduit, luminiares, equipment, and appurtenances in such a manner that the finished installation is as indicated on drawings. In the event difficulties are encountered which prevent this, it is the Contractor's responsibility to bring this to the attention of the COTR prior to initiation of work. Correct improperly coordinated installation at no additional cost.

E. The Contractors' assistants shall include a competent electrical supervisor, who shall be on the premises at all times to check, layout, coordinate and superintend the installation of work. The supervisor shall establish basic requirements relative to the work before starting, and be responsible for the accuracy thereof.

1.9 SUBMITTALS

A. Manufacturers' and subcontractors' lists:

1. As specified in Division 01, submit a complete list of proposed manufacturers for equipment, materials and subcontractors used for the work of this division. Lists shall follow the sequence of the specifications. No considerations will be given for partial or incomplete lists. After review of lists, submit shop drawings and product data.

B. Shop drawings and product data:

1. Submit in accordance with the requirements of Division 01 or as established at the preconstruction conference, the required number of copies of Shop Drawings and Product Data for every item of equipment. Shop drawings or product data will not be considered until Manufacturers' Lists have been approved. Shop drawings and product data shall be submitted, as required by the General Conditions, with sufficient time for checking, return to Contractor, and resubmission as required before Contractor shall install any item.
2. Each item submitted shall be properly labeled, indicating the specific service for which the equipment or material is to be used, section and paragraph number of specification or drawing number to which it applies, Contractor's name and project name and number. Data submitted shall be specific and shall include product data and printed information in sufficient detail and scope to verify compliance with requirements of the contract documents. Clearly identify each item within the data. Data of a general nature will not be accepted. Each sheet must clearly show the project name and number.

3. The review of a shop drawing or product data shall not be considered as a guarantee of the measurements or building conditions or that the shop drawings or product data have been checked to see that item submitted properly fits the building conditions. This review shall not relieve the Contractor of the responsibility for furnishing material or performing work as required by the contract documents, for correctness of dimensions and quantities, or for proper coordination of details and interfaces among trades.
4. Exclusively electrical items furnished as items associated with mechanical items but not specifically described in the mechanical item submission, shall be submitted as a separate submittal but shall be clearly marked as associated with the mechanical item by identified specification paragraph.
5. Product data sheets shall be 8.5-inches by 11-inches cut sheets for operating and maintenance manual.

C. Submit at least three copies of the results of every test required under any section in this division.

D. Specialist shall submit a list of at least three projects similar to this project in type, size, and quality, which have been in place and operating satisfactorily for at least five years.

1. Include project name, address, name and phone number of owner's representative, and project type and size.

E. After the work is completed, submit required certificates of approval from approved inspection agencies and authorities having jurisdiction over work of this division. Certificates of approval must be received by the COTR prior to final acceptance of the work.

1.10 SPECIALIST

A. The term "Specialist" as used in the specification shall mean an individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field,) which is regularly engaged in, and which maintains a regular force of workers skilled in either (as applicable) manufacturing or fabricating items required by the contract, installing items required by the contract, or otherwise performing work required by the contract. Where the specification requires installation by a specialist, the term shall also be deemed to mean the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform the work under the manufacturer's direct supervision.

1.11 CONTRACT CLOSEOUT SUBMITTALS

A. Project record documents:

1. Maintain on site one set of the following record documents; record actual revisions to the work of this division:

a. Contract Drawings.
b. Specifications.
c. Addenda.
d. Change Orders and other Modifications to the Contract.
e. Reviewed shop drawings, product data, and samples.

2. Maintain record documents separate from documents used for construction.
3. Record information concurrent with construction progress.

4. Specifications: Legibly mark and record in each section a description of actual products installed, including the following:

    a. Manufacturer's name and product model and number.
    b. Product options, substitutions, or alternates utilized.
    c. Changes made by addenda and modifications.

5. Record documents and shop drawings: Legibly mark each item to record actual construction, including:

    a. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
    b. Field changes of dimension and detail.
    c. Details not on original Contract Drawings.

6. Submit documents as specified in Division 01.

B. Operation and maintenance data:

1. Submit sets prior to final inspection as specified in Division 01. Unless otherwise specified in Division 01, submit no fewer than three sets. In addition to requirements specified in Division 01, submit operating and maintenance manuals for the work of this division as specified below.
2. Binders: Three-ring binders with vinyl-covered hard covers.
3. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS," and title of project. Print on spine of binder "O & M INSTRUCTIONS." If more than one binder is required, print covers and spines with volume numbers. Include in the front of every binder an index to all binders.
4. Internally subdivide the binder contents with permanent page dividers, logically organized as described below.
5. Contents: Prepare a Table of Contents , with each product or system description identified , typed on white paper.
6. Part 1: Directory, listing names, addresses, and telephone numbers of electrical engineers; contractor; electrical subcontractors; and major electrical equipment suppliers.
7. Part 2: Operation and maintenance instructions, arranged by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:

    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component, including recommended spare parts list.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.

8. Part 3: Project documents and certificates, including the following:

    a. Shop drawings and product data.
    b. Photocopies of certificates.
    c. Photocopies of warranties, guarantees, and bonds.

d. Test reports: Copies of the results of tests required under sections of specifications.

9. Submit one copy in final form 15 days prior to final inspection. This copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.
10. Submit final revised copy within ten days after final inspection.
11. Submit operation and maintenance data in electronic format as well.

1.12 REGULATORY REQUIREMENTS

A. When these specifications call for materials or construction of a better quality or larger sizes than required by the following codes and standards, the provisions of the specifications shall take precedence.

B. Provide, without extra charge, any additional materials and labor which may be required for compliance with these codes and standards even though the work is not mentioned in these specifications or shown on the contract drawings.

C. Perform the work of this division in strict accordance with the following authorities. The latest revision of these codes accepted by the authority having jurisdiction as of the date of the contract documents shall apply.

1. The electrical, building, fire, and safety codes of the state and county or city in which the work is being performed.
2. The National Electric Code, NFPA 70 (NEC).
3. The National Fire Protection Association Code (NFPA).
4. International Building Code (IBC).
5. International Energy Conservation, Fire, and Electrical Codes (ICC).

1.13 REFERENCE STANDARDS

A. Perform the work of this division using the standards of the following organizations, as referred to in technical sections, as a minimum requirement for construction and testing. Unless specified otherwise in Bidding and Contract Documents or Division 01, the latest revision current as of the date of the contract documents shall apply.

1. Factory Mutual (FM)
2. Federal Specifications (FS)
3. American National Standards Institute (ANSI)
4. American Society for Testing and Materials (ASTM)
5. International Code Council (ICC)
6. Institute of Electrical and Electronics Engineers (IEEE)
7. National Electrical Code (NEC) (NFPA 70)
8. National Electrical Manufacturer’s Association (NEMA)
9. National Fire Protection Association (NFPA)
10. The Occupational Safety and Health Act (OSHA)
11. Underwriters Laboratory Inc. (UL)
12. American Association of State Highway and Transportation Officials (AASHTO)
13. American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE)
14. Illuminating Engineering Society of North America (IESNA)

1.14 TEMPORARY STORAGE

A. Maintain upon premises, where directed, a storage area, and be responsible for contents within these areas. Provide security measures necessary for this area.

B. Area shall be maintained and shall be returned to original condition at the completion of the project.

C. Store electrical construction materials such as wire, raceways and boxes, devices, and equipment in buildings, enclosed trailers, or portable enclosed warehouses.

1. Materials and products subject to damage from moisture: Store in dry locations. If necessary, protect with protective wraps or covers.
2. Plastics and other materials and products subject to damage from heat or cold: Store at manufacturer's recommended temperatures.
3. Plastics and other materials and products subject to damage from sunlight: Protect from sunlight.

D. Electrical equipment such as motor controllers, panelboards and circuit breakers stored before installation and installed during construction: Provide clean, dry locations at manufacturer's recommended temperatures, and cover or wrap if required to protect from incidental damage.

1.15 PROTECTION

A. Control dust resulting from construction work to prevent its spread beyond the immediate work area, and to avoid creation of a nuisance.

1. Do not use water to control dust. Use drop cloths or other suitable barriers.
2. In areas where dirt or dust is produced as a result of the work, sweep daily, or more often as required.
3. Provide walk-off mats at entries and replace them at regular intervals.
4. Construct dust partitions, where indicated on the drawings or as required.
5. Protect areas occupied by Owner's personnel or equipment.
6. Seal off return air registers and other mechanical systems to prevent dust from entering.

B. Each trade and subcontractor is responsible for preventing damage and soiling of work performed by other trades or subcontractors. Each trade and subcontractor is responsible for providing temporary protection of its own work.

1. Protect work from spills, splatters, drippings, adhesives, bitumens, mortars, paints, plasters, and damage from welding or burning.
2. Protect finished work from damage, defacement, staining, or scratching.
3. Protect finishes from cleaning agents, or grinding and finishing equipment.
4. Protect adjacent and finished work from damage, using tape, masking, covers or coatings and protective enclosures.
5. Coordinate installations and temporarily remove items to avoid damage from finishing work.

C. Repair damage or soiling to the complete satisfaction of the COTR; replace any materials or work damaged to such an extent that they cannot be restored to their original condition, at no addition to the Contract sum.

D. Protect work stored in place and supplies stored in the building.

1. Store materials and products, subject to damage from moisture, in dry locations. If necessary, protect in wraps or covers.
2. Store plastics, other materials, and products subject to damage from heat or cold at manufacturer's recommended temperatures.

E. Protect electrical materials and products from weather events and accidents of construction.

F. Use of sidewalk or roadway areas outside of the property lines shall be with permission and approval of the local authorities having jurisdiction.

1.16 FIRE PROTECTION

A. As a minimum, provide hand-carried, portable, UL-rated extinguishers with each work crew working inside the building.

B. Select extinguishers in accordance with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

1.17 PROJECT CONDITIONS

A. Drawings showing utilities in concealed locations are based on the best information available but are not represented as being precisely correct. Work of the contract includes digging, cutting, drilling, using nondestructive methods, and other methods of locating concealed utilities in the field, as well as patching and repairing as specified in "Cutting and Patching" below.

B. If, in the course of the work, workers encounter a material they suspect to present some hazard:

1. Promptly notify the COTR in writing.
2. Do not perform any work which would disturb the suspected material until written instructions have been received.

1.18 WARRANTY

A. Work and equipment provided as work of this division shall be fully warranted under the general project warranty. In addition, provide added special warranties as specified in individual sections.

B. During the correction period, the Contractor shall begin correcting any work found to be not in accordance with the requirements of the Contract Documents within 4-hours of receiving written notice from the COTR. Provide detailed schedule for completion of work within 24-hours of receiving written notice from the COTR and revise schedule based on any COTR comments generated. Except as otherwise required in General Conditions and Division 01, the correction period is one year after the date of substantial completion of the work. Work requiring correction shall promptly be repaired or completely replaced at no addition to the Contract Sum.

1. Service reports for warranty work shall be provided to the COTR.

C. When use of the permanent equipment has been permitted for temporary services during construction of the building, the warranty and correction periods shall nevertheless begin at the time of substantial completion, unless another date of acceptance has been agreed to by the COTR.

D. Special warranties are warranties required by individual specification sections, incidental product warranties, manufacturers' standard warranties, installer or subcontractor service agreements, and other individual warranties in addition to the general project warranty.

E. Provide copies of warranties as required for Operation and Maintenance Manual specified above, and by Division 01.

F. For items of work delayed beyond date of substantial completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

B. Where new equipment must pass through existing openings (e.g., doors), measure width of opening and width of equipment. If equipment is wider than opening, perform whatever measures are necessary to widen opening (e.g., removal of door frames), then restore opening to its original condition.

C. Cut walls, floors, partitions, roofs, and other appurtenances for the passage or accommodation of conduits. Close superfluous openings and remove debris caused by work of this division.

D. No cutting of any structure or finish shall be done until the condition requiring such cutting has been examined and approved by the COTR.

E. New or existing surfaces disturbed as a result of such cutting or otherwise damaged shall be restored to match original work and materials used for any patching or mending shall conform to the class of materials originally installed.

F. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

3.2 TEMPORARY FACILITIES

A. Temporary water facilities, electricity, telephone, toilet facilities, and temporary heat, shall be provided as specified in Division 01.

3.3 PROGRESS MEETINGS

A. Progress meetings shall be held as specified in Division 01, and also when and if the Contractor or COTR finds them necessary or advantageous to progress of work.

B. Contractor, those subcontractors, and material suppliers concerned with current progress or with the scheduling of future progress, COTR and COTR shall each be represented at these meetings by persons familiar with the details of work and authorized to conclude matters relating to work progress.

END OF SECTION 260101

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Requirements applicable to work of more than one section of Division 26.

B. Basic materials and equipment required for electrical work.

C. Operating instructions.

D. Testing wiring systems.

1.2 RELATED SECTIONS

A. Project and special warranties: Division 01 and Section 260101.

B. Operation and Maintenance Manuals: Division 01 and Section 260101.

C. Painting: Division 09.

1.3 DEFINITIONS

A. Project correction period: A period after Substantial Completion of the work during which the Contractor shall correct every part of the work found to be not in accordance with the requirements of the contract documents, promptly after receipt of written notice.

B. Qualified testing agency: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

1.4 DESIGN REQUIREMENTS

A. The drawings and system performances have been designed on the basis of using the particular manufacturers' products specified and scheduled on the drawings.

B. Products of other manufacturers that are listed under the article "Acceptable Manufacturers," or permitted as "equal," are permitted provided:

1. Product shall meet the specifications.
2. Contractor shall make, without addition to the contract sum, all adjustments for deviations so that the final installation is complete and functions as the design basis product is intended.

C. Do not propose products with dimensions or other characteristics different from the design basis product that make their use impractical or cause functional fit, access, or connection problems.

1.5 SUBMITTALS

A. Test reports: Show that tests specified in Part 3 below demonstrate the specified results.

1.6 QUALITY ASSURANCE

A. Provide materials and perform work in accordance with the electrical, building, fire, and safety codes and regulations of the state, county, or city in which the work is performed.

B. Electrical control panels, equipment, materials and devices provided or installed as work of Division 26 shall bear UL label, or, if UL label is not available, the item shall be tested and labeled by a qualified testing agency, acceptable to authorities having jurisdiction, and in accordance with NFPA 70. Provide testing, if required, without addition to the contract sum.

C. VOC content: Field-applied adhesives and sealants, limits per South Coast Air Quality Management District (SCAQMD), Rule No. 1168.

D. Products shall contain no urea-formaldehyde content.

PART 2 - PRODUCTS

2.1 GENERAL

A. Techniques, testing, and operating instructions specified in this section apply to products specified in other sections of Division 26.

B. Equipment that uses or processes date and time data in order to perform its function shall be warranted by the manufacturer to properly function and correctly use or process all time-related data for all dates and times which occur during a reasonable life expectancy of the equipment.

PART 3 - EXECUTION

3.1 GENERAL

A. Manufacturers' instructions: Except as modified by drawings or specifications, install products and equipment in accordance with manufacturers' instructions and recommendations applicable to the project conditions.

1. Immediately notify COTR if a difference or discrepancy is found between manufacturers' instructions and the drawings or specifications.

B. The contract drawings are diagrammatic, and do not indicate all fittings or offsets in raceway or all pull boxes, access panels, or other specialties required. Provide required fittings, offsets, access panels, and specialties to coordinate the work.

C. No raceway shall be run below the head of a window or door.

D. Equipment and raceways installed in areas without a suspended ceiling shall be as tight to structure as possible, but at least above a height of 2032 mm (6'-8"), unless otherwise noted.

E. Items which require access for operation or maintenance shall be easily accessible. Do not cut or form hand holes for operation or maintenance of appliances through walls or ceilings.

3.2 INSTALLATION OF PRODUCTS AND EQUIPMENT

A. Install raceway exposed to view parallel with the lines of the building and as close to walls, columns, and ceilings as may be practical, maintaining adequate clearance for access at parts requiring servicing.

B. Install raceway a sufficient distance from other work to permit a clearance of not less than 13 mm (0.5 inch) between its finished covering and adjacent work.

C. Pull boxes and other appurtenances which require operation or maintenance shall be easily accessible. Do not cut or form handholes for operation or maintenance of appliances through walls or ceilings.

D. Install plywood backing panels with finished face exposed.

3.3 OPERATING INSTRUCTIONS (DEMONSTRATION)

A. Furnish the necessary technicians, skilled workers, and helpers to operate the electrical systems and equipment of the entire project for one 8-hour day.

B. Where specified in technical sections, provide longer periods required for specialized equipment.

C. Instruct the Owner or designated personnel in operation, maintenance, lubrication, and adjustment of systems and equipment.

1. Instructions by manufacturer's technical representative for each type of equipment shall include the performance of the recommended preventive maintenance procedures for that equipment.

D. The Operating and Maintenance Manual shall be available at the time of the instructions for use by instructors and Owner personnel.

E. Schedule the general and specialized instruction periods for a time agreed upon by the COTR.

3.4 TESTS

A. During the progress of the work and after completion, test the branch circuits and distribution system.

B. Results of the tests shall show that the wiring meets the requirements of this specification. Should any test indicate defect in materials or installation, immediately repair, or replace with new, the faulty installation, and retest the affected portions of the work.

C. Furnish equipment and instruments necessary for testing.

D. Tests shall demonstrate the following:

1. Lighting, power, and control circuits are continuous and free from short circuits.
2. Circuits are free from unspecified grounds.
3. The resistance to ground of each non-grounded circuit is not less than one megohm.
4. Circuits are properly connected in accordance with the applicable wiring diagrams.
5. Circuits are operable. Demonstration shall include functioning of each control not less than ten times, and continuous operation of each lighting and power circuit for not less than 0.5 hour.

E. Test circuit breakers larger than 100 amps at full voltage.

F. Make voltage built-up tests with a voltage sufficient to determine that no short circuits exist.

G. Immediately repair defects and retest until systems are operating correctly.

H. Submit test reports.

END OF SECTION 260500

SECTION 260504 - ELECTRICAL DEMOLITION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Extent and location of demolition are shown on the drawings.

B. Removal of items for reuse.

1.2 RELATED SECTIONS

A. Demolition: Division 02.

1.3 SUBMITTALS

A. Project record documents:

1. Record drawings.

1.4 QUALITY ASSURANCE

A. Demolition shall be carried out as expeditiously as possible, in accordance with accepted practice and applicable building code provisions.

1.5 PROJECT CONDITIONS

A. If, in the course of the work, workers unexpectedly encounter a material not identified for special removal but which they suspect to be asbestos, to contain lead or PCBs, or to present some other hazard:

1. Promptly notify the COTR in writing.
2. Do not perform any work which would disturb the suspected material until written instructions have been received.

B. Protect adjacent materials indicated to remain. Install and maintain dust and noise barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.

C. Locate, identify, and protect mechanical and electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect existing building and equipment that is to remain, particularly to prevent entry of either dust or water. Ensure weathertightness at all times. Keep materials on hand to patch and maintain protection.

3.2 DEMOLITION

A. Comply with demolition and disposal requirements of Division 02.

B. Perform removal work neatly with the least possible disturbance to the building.

C. Provide temporary barriers, danger signals, and appurtenances for protection of personnel and equipment during removal operations.

D. Demolish, remove, demount, and disconnect inactive and obsolete raceway, fittings and specialties, equipment, and fixtures.

1. Raceway and ducts embedded in floors, walls, and ceilings may be abandoned in place if they do not interfere with new installations. Cut back to at least one inch below finished surface.
2. Remove materials above accessible ceilings.
3. Disconnect and cap items to remain behind finished surfaces.
4. Patch and repair surface materials as required in Division 01 and Section 26 01 01 article, “Cutting and Patching.”
5. If existing raceways, outlet boxes, and junction boxes are shown to be removed, but could be reused for new work, Contractor may submit a request in writing to the COTR to reuse the existing materials rather than remove them. The request shall include drawings indicating the exact raceways, outlet boxes, and junction boxes to be reused.

E. Remove the anchors, bolts, and fasteners associated with raceway and equipment to be removed.

3.3 ITEMS FOR REUSE

A. The following items shall be removed and reused as indicated or specified:

1. Dish antenna
2. Antenna cable
3. Ballasts and fittings for securing antenna and cable to roof.

B. Remove items to be reused in a manner to prevent damage. Pack or crate if required to protect the items from damage in storage.

3.4 DISPOSAL

A. Dispose of equipment and materials removed, and rubbish and waste material, as work progresses. Do not allow demolition debris to accumulate on site. Remove products of demolition from the building daily.

END OF SECTION 260504

SECTION 260519 - WIRES AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Wires and cables rated 600 volts and less.

B. Type MC, Type AC, Type AC-HCF and Type NM cables are not permitted.

1.2 RELATED SECTIONS

A. Raceways: Section 260533.

1.3 REFERENCES

A. ANSI/NEMA WC 70: Power Cables rated 2000 Volts or Less for Distribution of Electrical Energy.

B. ASTM B3: Standard Specification for Soft or Annealed Copper Wire.

C. ASTM B8: Standard Specification for Concentric-Lay-Stranded Copper Conductors.

D. UL 44: Standard for Thermoset-Insulated Wires and Cables.

E. UL 83: Standard for Thermoplastic-Insulated Wires and Cables.

F. Additional UL Standards as indicated.

1.4 SUBMITTALS

A. Product data:

1. Each type of wire and cable, including accessories.
2. Include copies of UL certifications showing compliance with requirements in “Quality Assurance” below.

1.5 QUALITY ASSURANCE

A. Electrical components, devices, and accessories: Listed and labeled as defined in NFPA 70 Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Products and installation shall comply with NFPA 70 and other applicable national, state, and local electrical codes.

1.6 DELIVERY, STORAGE, AND HANDLING

A. General requirements: Deliver, store, and handle wire and cable in accordance with the manufacturer’s instructions.

1. Wire and cable shall be packaged in a manner that protects them during ordinary handling and shipping. Ship from manufacturer with ends temporarily sealed against moisture.
2. Protect wire and cable during storage (both onsite and offsite).

    a. Store in a clean and dry location. Elevate from surfaces where water can accumulate, and cover cable rolls to protect against weather.

3. Handle wire and cable as recommended by the manufacturer. Do not pull from the center or periphery of the cable reel.
4. Damaged wire and cable shall be removed from the project site.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE (600 volts maximum)

A. Conductors: UL listed and NEMA WC 70 compliant; Copper, 98 percent conductivity, suitable for 600-volt duty; rated 90-degree Celsius temperature for wet/dry applications; solid bare annealed copper for No. 10 and smaller complying with ASTM B 3, and stranded for No. 8 and larger complying with ASTM B 8.

B. Conductor insulation:

1. Type THHN / THWN-2: Comply with UL 83; PVC insulation, nylon jacket.

C. Conductor identification: Markings along outer braid denoting conductor size, voltage classification, type of insulation, and manufacturer's trade name, and color code. Identification shall extend to branch circuits and outlets. Use the color coding system tabulated below throughout the building's network of feeders and circuits, unless otherwise required by the authority having jurisdiction.

1. Colors on conductors No. 10 and smaller, or No. 6 and smaller for grounded and grounding conductors: Solid colored insulation.
2. Colors on conductors No. 8 and larger, or No. 4 and larger grounded and grounding conductors: Colored tape wrapped a minimum of 6 inches (150 mm) on either end of conductor.

COLOR CODE (600 volts maximum)				
VOLTAGE	NEUTRAL	PHASE		
		A	B	C
120 volts, 2-wire	White	Black, Red, or Blue depending on phase		
277 volts, 2-wire	Gray	Brown, Orange, or Yellow depending on phase		
208 volts, single-phase, 2-wire		Black/Red, Red/Blue, or Blue/Black		
208/120 volts wye, 3-phase, 4-wire	White	Black	Red	Blue
240/120 volts, single-phase, 3-wire	White	Black	Red	
240 volts delta, 3-phase, 3-wire		Black	Red	Blue
240 volts delta, 3-phase, 3-wire, B-phase grounded		Black	White	Blue
480/277 volts wye, 3-phase, 4-wire	Gray	Brown	Orange	Yellow
480 volts delta, 3-phase, 3-wire		Brown	Orange	Yellow

D. Wires used solely for grounding purposes shall be green, where insulated. Insulated equipment ground conductors for isolated ground type receptacle circuits shall be green with a yellow strip.

E. Control wiring shall be coded with colors different from those used to designate phase wires.

2.2 WIRING ACCESSORIES

A. Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service where installed.

B. Twist-on wire connectors (dry locations):

1. Color-keyed.
2. Basis of design: Ideal Industries, Inc., Wingnut®, 3M Company "Scotchlok", or King Innovation.

C. Twist-on wire connectors (damp and wet locations):

1. Connectors shall be listed under UL 486D.
2. Basis of design: Ideal Industries, Inc., UnderGround®, models 60, 64, or 66 as appropriate; King Innovation DryConn®; or 3M Company.

D. Compression connectors:

1. Color-keyed.
2. Basis of design: 3M Company "Scotchlok"™ compressor connectors, "10000" series for copper conductors or Thomas & Betts (Blackburn) or Ilsco.

E. Compression connectors (damp and wet locations):

1. Protect connectors with a waterproof system, UL-listed for direct burial and 600 volts.
2. Basis of design: 3M Company 8420 series, Thomas & Betts Model DBSK82, or IIsco.

F. Compression taps:

1. Series CT-2 tap with CT-2C cover, or Series 54710 color-keyed compression taps,
2. Basis of design: Burndy Corporation "Versitap" or OZ/Gedney.

G. Power distribution blocks:

1. Basis of design: Hubbell Burndy “U-Blok.”

H. Multi-tap connectors, clear insulated:

1. Basis of design: Burndy Corporation "UNITAP" or Ilsco "Cleartap".

2.3 PLENUM CABLES

A. Plenum cable:

1. Insulated with material that is UL classified for low flame and smoke-spread characteristics, for use in plenum areas without raceway in accordance with the requirements of NFPA 70.
2. Communications cable: Type MPP or CMP in accordance with NFPA 70.
3. Insulator basis of design: Dupont “Teflon FEP”.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide wire and cable indicated in accordance with the electrical codes of the Smithsonian Institution.

B. Conceal wire and cable in locations with finished walls, ceilings, and floors unless otherwise noted on drawings.

C. Wire and cable serving systems over 100 volts shall be installed in raceways, except where otherwise noted on drawings.

D. Wire and cable serving systems rated below 100 volts shall be installed in raceways, except where otherwise noted in individual specification sections. Refer to paragraph “INSTALLING CABLE RATED BELOW 100 VOLTS” below for additional information.

3.2 INSTALLING WIRING

A. Sizes: Minimum sizes shall be as follows, unless a larger size is indicated on the drawings.

1. 120-volt branch circuits:

a. Homerun from first outlet to panel: No. 12 when run is 50 feet (15,000 mm) or less; No. 10 when run is between 50 feet (15,000 mm) and 100 feet (30,000 mm); No. 8 when run is more than 100 feet (30,000 mm).
b. First outlet to other outlets: No. 12.

2. Exit light and emergency lighting circuits: No. 12. Do not install in raceways, outlet boxes, or other locations with non-emergency wiring systems.
3. Other systems (over 100-volts): Minimum No. 12 unless specified or shown on drawings to be smaller.

B. Wiring methods and locations: Provide Type THHN / THWN-2, single conductors in raceway, unless otherwise noted.

C. Splicing shall be done in outlet boxes and junction boxes and not in raceway.

1. Conductors No. 8 and larger: Terminated, spliced and taped, wherever practical, with compression connectors or solderless connectors. Use tools recommended by the manufacturer.

2. Splices in conductors No. 10 and smaller, including lighting fixtures: Made with wire connectors.
3. Taps in conductors No. 6 and larger: Made with compression taps or power distribution blocks.

D. Wiring in high ambient temperature areas shall be of types required by NFPA 70.

E. Wires shall be neatly shaped in panels, wireways, boxes, and appurtenances.

3.3 COORDINATION WITH DEVICES AND EQUIPMENT

A. Where conductor size or parallel conductors shown on drawings connect to terminals on devices or equipment which is not sized for the connection:

1. Provide a junction box as near the equipment as possible, but no more than 10 feet (3 m) away. Obtain approval of location before installing.
2. Provide conductor(s) sized to the ampacity of the equipment, from equipment to junction box.
3. In the junction box, splice the conductors from the equipment to the conductors of sizes, or parallel conductors, shown on the drawings.

3.4 INSTALLING CABLE RATED BELOW 100 VOLTS

A. Install in raceway, unless otherwise indicated in individual specification sections.

1. Conceal raceway and cables, except in unfinished spaces and in open ceiling spaces.
2. Cable not in raceways or on cable tray:

a. Do not install in hangers used for pipes, electric raceways, or ceiling hangers, nor support it in any way by attachments to pipes, raceways, or ceiling hangers.
b. Install without damaging conductors, shield, or jacket. Cables shall not run through structural members or be in contact with pipes, ducts, or other potentially damaging items.
c. Install away from potential EMI sources, including electrical power lines and equipment.
d. Install parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.

3. Cable support with J-hooks:

a. Install J-hooks at intervals not exceeding 1525 mm (sixty inches).
b. Secure cables on J-hooks with cable ties. Avoid cinching cables.
c. Provide separate J-hooks for each low-voltage system.

4. Each cable run shall contain an ‘S’ loop or other means to accommodate expansion or contraction.
5. Where ceiling plenums are used for passage of air by heating and air conditioning system, install cable in raceway.

B. For cable installed in raceway, comply with requirements for raceways and boxes specified in Section 260533, Raceways, and Section 260534, Boxes.

1. Provide separate raceway systems for each low-voltage system.

2. Pull cables without exceeding cable manufacturer's recommended pulling tensions.

    a. Pull cables simultaneously if more than one is being installed in same raceway.
    b. Use pulling compound or lubricant, if necessary. Use compounds that will not damage conductor or insulation.
    c. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage cables or raceway.

C. Avoid installing near hot utilities, which might adversely affect system performance or result in damage to the cable. If cable must be placed close to such utilities, keep it separate and protect with insulation.

D. Cable bends shall have a radius not less than the value recommended by the cable manufacturer.

E. Tag cables connected to electronic equipment, to show function and the location of other end. Securely fasten labels to the cable.

END OF SECTION 260519

SECTION 260521 - WIRING CONNECTIONS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Power and control wiring for equipment.

1.2 RELATED SECTIONS

A. Equipment: Installed items requiring electricity, specified in other sections or shown on drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Raceways, wires and cables, devices, and accessories as specified in other sections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide power wiring from the motor starters to each motor and its manual controlling device. Interlock and control wiring related to the automatic temperature control system shall be provided under Section 230902, Control Systems Wiring.

    1. Make flexible or liquidtight connections as specified in Section 260533, Conduits.

B. Rough in and connect to equipment temporarily disconnected to allow for roof replacement. Make connections as indicated on drawings with exact locations and details determined by approved shop drawings of the equipment.

    1. Under equipment sections, equipment will be set in position and the electrical devices and components furnished loose. Assemble, install, and wire under this section.
    2. Accomplish rough-in from walls with flush outlet boxes and from floors by means of raceway couplings finishing flush with finished floor.

END OF SECTION 260521

SECTION 260526 - GROUNDING AND BONDING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding electrical systems and equipment.

1.2 RELATED SECTIONS

A. Lightning protection: Section 264113.

1.3 REFERENCES

A. IEEE STD 142

B. NFPA 70

C. ASTM F467 and F468

D. UL 467

1.4 SUBMITTALS

A. Product data: Connections.

B. Certifications: System test.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

A. Ground conductor, unless specifically noted otherwise, shall be copper, 98 percent conductivity, solid for No. 10 AWG and smaller and stranded for No. 8 AWG and larger.

1. Isolated equipment grounding conductors shall have green insulation with a yellow stripe, or shall be identified as specified in Part 3.

B. Mechanical type ground connectors:

1. Connectors:

a. IEEE 837 and UL 467 compliant, listed for use for specific types, sizes, and combinations of conductors and connected items.
b. Basis of design: FCI Burndy G Series.

2. Nuts, bolts, and washers: Silicon bronze alloy type B per ASTM F467 and F468.

C. Exothermic type ground connections:

1. Exothermic welding systems.
2. Basis of design: “Cadweld,” manufactured by Erico International Corporation.

D. Lugs:

1. Lugs shall be two- or four-hole.
2. Basis of design: Burndy Hylug series.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide the complete grounding of raceway systems, electrical equipment, conductor and equipment enclosures, motors, transformers, and neutral conductors in accordance with applicable codes. Grounded phase and neutral conductors shall be continuously identified. Continuity of metal raceways shall be insured by double locknuts.

B. Bonding straps and jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of raceway.

1. Bonding to structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to equipment mounted on vibration isolation hangers and supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connections for outdoor locations; if a disconnect-type connection is required, use a bolted clamp secured with a minimum of two bolts and lock washers.

3.2 EQUIPMENT GROUNDING AND BONDING

A. Provide insulated equipment grounding conductors with feeders and branch circuits.

B. Water heater, heat tracing, and antifrost heating cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

END OF SECTION 260526

SECTION 260533 - CONDUITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Conduit, raceways, and accessories, aboveground.

B. Where the words “conduit” or “conduits” are used without referring to a specific type of conduit (e.g., flexible metal conduit), the words include conduit and electrical metallic tubing.

1.2 RELATED SECTIONS

A. Firestopping: Division 07.

B. Boxes: Section 26 0534.

C. Painting: Division 09.

D. Cutting and patching: Section 26 0101.

1.3 DEFINITIONS

A. Conduit: Conduit, raceway, or tubing.

B. ARC: Aluminum rigid conduit.

C. EMT: Electrical metallic tubing

D. FMC: Flexible metal conduit.

E. LFMC: Liquid-tight flexible metal conduit.

1.4 SUBMITTALS

A. Product data:

1. Each type of raceway included in the work, and related fittings.
2. Sleeves and sleeve seals.
3. Accessory materials.
4. Hangers and fasteners.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

B. Steel raceway and tubing:

1. AFC Cable Systems, Inc. (FMC and LFMC)
2. Allied Tube & Conduit; a Tyco International Ltd-Co.
3. O-Z/Gedney, Unit of General Signal.
4. Wheatland Tube Co.

C. Steel raceway fittings:

1. Appleton Electric Co.
2. Cooper Crouse-Hinds.
3. Hubbell, Inc.; Killark Electric Manufacturing Co.
4. O-Z/Gedney; Unit of General Signal.
5. Spring City Electrical Manufacturing Co.
6. Thomas & Betts Corporation.
7. Wheatland Tube Co.

D. Wireways and fittings:

1. Hoffman Engineering Co.
2. Lamson & Sessions, Carlon Electrical Products.
3. Schneider Electric; Square D products.

E. Raceway hangers and supports:

1. Thomas & Betts “Kindorf”.
2. Tyco Power-Strut.
3. Unistrut Diversified Products.

F. Fasteners:

1. Caddy Fasteners by Erico Products Inc.
2. ITW Ramset “Red Head”.
3. Wej-It Fastening Systems.

2.2 RACEWAY AND FITTINGS

A. Steel raceway fittings: Cast malleable iron fittings with smooth finish and full threaded hubs. Include steel or malleable iron locknuts, bushings, and other fittings.

1. Insulating bushings: Basis of design: Thomas & Betts Series 22.
2. Hub fittings with recessed sealing ring and nylon insulated throat: Basis of design: Thomas & Betts Series 370.
3. Fittings for exposed locations: Raceway outlet bodies, cast iron or cast aluminum, zinc or cadmium plated.

B. Aluminum rigid conduit (ARC): rigid full weight, heavy-wall aluminum conduit (ARC) conforming to ANSI C80.5 and UL 6A.

C. Aluminum conduit fittings: aluminum with smooth finish and full threaded hubs. Include aluminum locknuts, bushings, and other fittings.

1. Insulating bushings: Basis of design: Thomas & Betts Series 22.

2. Hub fittings with recessed sealing ring and nylon insulated throat: Basis of design: Thomas & Betts Series 370AL.
3. Fittings for exposed locations: Conduit outlet bodies, cast aluminum.

D. Electrical metallic tubing (EMT):

1. Indoors: Hot-dip galvanized or sherardized thin-wall steel conduit conforming to UL 797 and ANSI C80.3.

E. Connectors and couplings for EMT: Concrete- or rain-tight, set screw type, made of zinc- or chromium-plated steel. Connectors shall have nylon insulating throats.

1. Set screw connector: Basis of design: Steel City No. TC722A.
2. Set screw coupling: Basis of design: Steel City No. TK122A.

F. Flexible metal conduit (Type FMC): Made of sheet metal strip, interlocked construction, conforming to UL 1.

G. Liquidtight flexible metal conduit (Type LFMC) shall conform to UL 360.

H. Connectors for flexible metal conduit:

1. Connectors: Angle wedge with nylon insulated throat. Basis of design: Thomas & Betts “Tite-Bite” connector Series 3110 and 3130.
2. Aluminum rigid conduit to LFMC couplings: Basis of design: O-Z/Gedney Type 4Q.

I. Liquidtight type connectors:

1. UL 14814A. Fittings: With nylon insulated throat.
2. Basis of design: Thomas & Betts Series 5331.

J. Wireways: Steel wireway with hinged cover, complying with UL 870 Standard for Wireways, Auxiliary Gutters, and Associated Fittings.

1. Cover: Front accessible opening along complete length of wireway.
2. Finish:

    a. Indoors: Gray polyester powder finish inside and out.
    b. Outdoors: Provide NEMA 4X wireways constructed of stainless steel.

3. Basis of design: Square D "Square-Duct".

K. Fittings for wireways: Made with removable covers to permit installation of a complete system with access to wires throughout the system, UL listed with wireways. Connections: Threaded screws at every connector.

L. Weatherproof expansion fittings:

1. With bonding jumpers.
2. Basis of design: O-Z/Gedney Types AX and TX.

2.3 SLEEVES FOR RACEWAYS

A. Steel pipe sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

1. Sleeves for exterior walls: Anchor flange welded to perimeter.

B. Sleeves for rectangular openings: Galvanized sheet steel of length to suit application. Minimum thickness:

1. For sleeve cross-section rectangle perimeter less than 1270 mm (50 inches) and no side more than 400 mm (16 inches): 1.3 mm (0.052 inch).
2. For sleeve cross-section rectangle perimeter equal to or more than 1270 mm (50 inches) and one or more sides equal to or more than 400 mm (16 inches): 3.5 mm (0.138 inch).

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07.

2.4 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annual space between sleeve and raceway.

1. Sealing elements: EPDM or NBR interlocking links shaped to fit surface of cable or raceway. Include type and number required for material and size of raceway or cable.
2. Pressure plates: Reinforced nylon polymer. Include two for each sealing element.
3. Connecting bolts and nuts: Stainless-steel of length required to secure plates to sealing elements. Include one for each sealing element.

2.5 ACCESSORY MATERIALS

A. Pull rope: Polypropylene, minimum 5 mm (0.1875 inch) thick, tensile strength 3559 newtons (800 pounds), work load 578 newtons (130 pounds).

B. Caps and plugs:

1. Basis of design: Thomas & Betts Series 1470.

C. Lubricant:

1. UL approved.
2. Basis of design: Ideal Industries, Inc. “Yellow 77”.

D. Bituminous protective coating: Coal tar based, self-priming on steel, applied in a wet film thickness at least 22.0 mils (559 microns) per coat.

E. Rust inhibitive paint:

1. Alkyd based, white, black, or bronzetone; applied in a wet film thickness of at least 0.074 mm (2.9 mils).
2. Basis of design: Benjamin Moore Super Spec HP D.T.M. Alkyd Low Lustre P23.

2.6 RACEWAY HANGERS

A. Adjustable hangers:

1. Basis of design: Kindorf C-711 lay-in hanger or C-710 Clevis hanger.

B. Trapeze hangers:

1. Constructed of channels with notched steel straps.
2. Steel strap basis of design: Kindorf C-105.

C. Channels:

1. Steel, 38 mm (1.5 inches) wide with 22-mm (7/8-inch) continuous slot, gauges and weights.
2. Basis of design: Kindorf B-900 series

a. Indoors: “Galv-Krom” trivalent chromium finish.
b. Outdoors: Stainless steel.

D. Beam clamps:

1. Adjustable type for connecting hanger rod to steel beam.
2. Basis of design: Kindorf E-160 or U-569

E. Hangers for raceway 27 mm (1.0 inch) and smaller, through or below bar joists: “Hang-on” hangers attached to joists with Minerallac scissor clips or two-piece stud clips.

F. Finish: For hangers, assemblies, plate washers, rods, locknuts, channels, bolts, and appurtenances:

1. Zinc plated.
2. Stainless steel, where required for weather-exposed or damp locations.

2.7 FASTENERS

A. General: Select fasteners such that load applied does not exceed one-fourth of manufacturer’s load capacity in 24000 kPa (3500 psi) concrete.

B. Fasteners to concrete: Self-drilling type expansion anchors, or machine bolt drop in anchors for drilled holes. Fasteners to concrete ceilings shall be vibration- and shock-resistant.

C. Fasteners to drywall or cavity wall: Toggle bolts, hollow-wall drive anchors, or nylon anchors as required.

D. Powder-actuated or drive pin type fasteners are not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Provide complete, separate and independent raceway system for each of the various wiring systems including, but not limited to, the following:

1. Lighting
2. Power
3. Exit Lighting*
4. Emergency Lighting System*
5. Fire Alarm System
6. Control Wiring
7. Voice and Data Systems
8. Sound System
9. Television System
10. Security Systems

*These wiring systems may be installed in common raceways.

B. Wire raceway systems completely, except where otherwise indicated, as shown on drawings and as required for satisfactory operation of each system.

C. Where wireways are required or used to facilitate the installation, size them to accommodate conductors, in accordance with NFPA 70.

D. Types and locations of raceways are scheduled at the end of the section.

E. Do not install conductors or pull rope during installation of raceway.

F. Where raceway is connected to a cabinet, junction box, pull box, or auxiliary gutter, protect the conductors with an insulating bushing. Provide locknuts both inside and outside the enclosure. Where raceway is stubbed up to above ceilings for future wiring, close ends with bushings.

G. Provide stainless steel hangers and supports for outdoor installations and where noted on drawings.

H. Bituminous protective coating:

1. Coat exposed threads on steel raceways in concrete slabs at couplings and fittings, after joints are made up.

I. Rust-inhibitive paint:

1. Exposed threads of exterior ferrous raceway.
2. Unfinished metal components.

J. Make turns in raceway runs with manufactured elbows or using machines or tools designed to bend raceway. Turns shall be not less than the various radii permitted by NFPA 70.

K. Sizes:

1. Do not use raceway smaller than 21 mm (0.75 inch).
2. Feeder raceways shall be as large as indicated, or as required by NFPA 70 (whichever is larger). Do not install more than one feeder in a single raceway.
3. Raceway sizes shown on drawings are based on Type THHN/THWN-2 wire.

L. Make vertical runs plumb and horizontal runs level and parallel with building walls and partitions.

M. Ground raceways as required by NFPA 70.

N. Where raceways pass through building expansion joints, and wherever relative movement could occur between adjacent slabs, equip with weatherproof expansion fittings and bonding jumpers.

O. Where raceways through roof cannot be installed inside equipment or pipe curbs, flash them in accordance with the SMACNA Architectural Manual.

1. Coordinate flashing details and materials with manufacturer and installer of roofing system.

P. Immediately after each run of raceway is completed, test it for clearance, smooth the joints, and close at each end with caps or plugs to prevent entrance of moisture or debris.

Q. Raceway installed outdoors or at indoor locations exposed to continuous or intermittent moisture shall provide a liquidtight seal. Use steel or malleable iron hub fittings for ferrous raceways. Use aluminum hub fittings for aluminum conduit. Coat exposed threads with bituminous protective coating.

R. Install insulated bushings on ends of raceway stubs and sleeves.

3.2 INSTALLING PULL BOXES, JUNCTION BOXES, OUTLET BOXES

A. Install as specified in Section 260534, Boxes.

B. Install pull or junction boxes in long runs of raceways or where necessary to reduce the number of bends in a run.

1. Select inconspicuous locations. Do not install until locations have been approved by the COTR.
2. Install boxes flush with wall or ceiling surfaces, with flat covers. Where removable ceiling units are used, locate boxes above ceilings.

3.3 INSTALLING FLEXIBLE CONDUIT

A. Installation shall comply with NFPA 70.

1. Minimum length: Two feet (610 mm).
2. Maximum length: Six feet (1830 mm).

B. Make immediate connections to transformers, recessed luminaires, speakers, and other equipment in suspended ceilings with flexible metal conduit. Include sufficient slack to permit removal of fixture or equipment.

C. Make immediate connections to motors with liquidtight flexible metal conduit. Include sufficient slack to reduce the effects of vibration.

D. In wet locations, install liquidtight type, in such a manner that liquid tends to run off the surface and not drain toward the fittings.

E. Where fittings are brought into an enclosure with a knockout, install a gasket assembly consisting of an O ring and retainer on the outside.

3.4 INSTALLING PULL ROPE AND CONDUCTORS

A. After raceway is installed, fish pull rope. After completion of the work of this project, pull rope shall remain in raceways identified as to be left empty. For each empty raceway, pull rope shall be of the same size, strength, and material as the ropes used to pull cables and conductors through similar raceways. Provide minimum 150 mm (six inches) of pull rope at each end.

B. Do not use a pull rope that has a tensile strength of more than one of the conductors of a two-wire circuit, more than two of the conductors of a three-wire circuit, or more than three of the conductors of a four-wire circuit.

C. Do not pull conductors into the raceways until the system is entirely completed and wet building materials are dry.

D. Use only a lubricant approved for use with conductor materials and pull rope materials.

3.5 INSTALLING SLEEVES

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07.

B. Concrete slabs and walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-rated assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

F. Size pipe sleeves to provide 0.25-inch (6.4-mm) annular clear space between sleeve and raceway unless sleeve seal is to be installed.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry.

H. Interior penetrations of non-fire-rated walls and floors: Seal annular space between sleeve and raceway, using joint sealant appropriate for size, depth, and location of joint.

I. Fire-rated-assembly penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway penetrations. Install sleeves and seal with firestop materials. Comply with Division 07.

J. Roof-penetration sleeves: Seal penetration of individual raceways with flexible, boot-type flashing units applied in coordination with roofing work.

K. Exterior-wall penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 25-mm (one inch) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.6 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway material and size. Position raceway in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 INSTALLING RACEWAY HANGERS

A. Single runs of overhead raceways 35-mm (1.25-inch) size and larger shall be supported by adjustable hangers, using 10-mm (0.375-inch) rods for raceways up to 53-mm (two inch) size and 13-mm (0.5-inch) rods for raceways larger than 53-mm (two inch)

B. Support groups of raceways run in parallel on trapeze hangers suspended from 13-mm (0.5-inch) hanger rods.

C. Space hangers not over three meters (ten feet). Support raceways within 3 feet of each outlet, junction or pull box.

D. Below bar joist construction, support hangers from a length of structural channel, welded to the top chords of at least two joists.

E. Where large numbers of raceways are grouped together, stagger individual hangers so as not to concentrate the load on a few joists.

F. Where hanger rods are attached to structural beams, use adjustable beam clamps.

3.8 RACEWAY IN EXISTING BUILDING

A. Remove superfluous electrical equipment and cap outlets not being used, as specified in Section 260504, Electrical Demolition.

B. In existing areas that are being renovated it is the intent to show on the drawings what the finished areas will contain when completed. Except as specified otherwise, existing raceway, and outlet boxes may be reused where they meet specifications and code requirements. Replace existing products or materials which are not suitable for reuse as determined by the COTR.

C. Suitably cap superfluous concealed outlets, and remove unused wire. Remove superfluous raceways exposed in finished areas, and abandon superfluous raceways concealed in walls.

D. Install concealed raceway in existing building wherever possible above ceilings, in new walls, and in existing furred spaces. Cut and patch finishes as needed to install raceway concealed. Install exposed raceway in secondary rooms, such as storage rooms.

E. Where existing raceway penetrates fire-rated partitions, and where there is no firestopping, provide firestopping. Maintain fire rating of walls, partitions, ceilings, and floors at existing raceway penetrations. Comply with Division 07.

3.9 SCHEDULE OF LOCATIONS

A. ARC with screw joint couplings:

1. Elbows penetrating floor slabs, exterior walls, or bearing walls.
2. Wiring to exterior equipment.
3. Exposed outdoor wiring except where otherwise noted.
4. Conduits run between top of beams and roof decking.

B. EMT:

1. Sizes 4 inches (102 mm) and smaller except as noted above.

C. FMC and LFMC:

1. Where noted elsewhere in this section.

END OF SECTION 260533

SECTION 260534 - BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Boxes with covers.

1.2 RELATED SECTIONS

A. Raceways: Section 260533.

B. Wiring devices: Section 262726.

C. Outlet boxes where required for special systems: Provided by the equipment manufacturers of the various systems.

1.3 SUBMITTALS

A. Product data: Each type of box included in the project.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

B. Boxes:

1. Appleton/EGS Electrical Group
2. RACO/Hubbell Electrical Products
3. Steel City/Thomas & Betts

2.2 MATERIALS

A. Outlet, switch, and junction boxes:

1. Sheet metal: NEMA OS 1, sherardized or galvanized stamped.
2. Cast-metal, where required for weather-exposed, or exposed locations: NEMA FB 1, aluminum, Type FD, with gasketed cover.

2.3 JUNCTION AND PULL BOXES

A. Junction and pull boxes in feeder raceway runs: Galvanized, of size required for raceway arrangement and not less than the size required by NFPA 70, and furnished with screwed covers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide box at each outlet, switch, and appurtenance. Each box shall be of a type suitable for the duty intended and shall be installed in accordance with the manufacturer's instructions.

1. Where raceway is weather-exposed or exposed, provide cast-aluminum boxes.

B. Coordinate locations of boxes with installation of raceway as specified in Section 260533.

C. Do not install boxes back-to-back (through the wall) in partitions.

D. Firmly secure the boxes in place, plumb, level, and with front of device cover even with finished wall surface.

E. Outlet boxes used for supporting luminaires: Furnish with malleable iron fixture studs of "No-Bolt" type, secured by locknut. Provide structural channel supports for boxes occurring in ceilings. Outlets in ceilings directly on bottom of joists shall be supported independent of ceiling construction. Special supports for boxes shall be as directed and approved by the COTR.

F. Where service fittings will not permit ganging of boxes for floor outlets, outlets shall be as close as practical.

G. Provide a single cover plate where two or more devices are grouped together in one box.

H. Verify door swings with door frame installed before locating switch outlets.

I. Outlet boxes in fire-rated assembly:

1. Clearance between boxes and wallboard shall not exceed 0.125 inch (3.2 mm).
2. Surface area of individual outlet box does not exceed 16 square inches (103 sq cm).
3. Entire surface area of boxes shall not exceed 100 square inches (645 sq cm) per 100 square feet (9.3 sq m) of wall surface.

3.2 IDENTIFICATION

A. Identification on outside covers of pull and junction boxes in ceiling space or exposed on walls: Paint with colored enamel or mark with permanent waterproof black marker, or both, as specified.

1. Fire alarm system: Red.
2. Other special systems: Mark with system type, such as Data or Security
3. Power and lighting: Panelboard designation and circuit number(s).

B. Identification inside boxes for recess-mounted or concealed in walls and partitions: Plasticized card stock tags marked with permanent waterproof black markers.

1. Fire alarm system: Fire alarm.
2. Other special systems: Mark with system type, such as Data or Security.

3. Power and lighting: Panelboard designation and circuit number(s).

END OF SECTION 260534

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes electrical identification materials and devices required to comply with ANSI, NFPA, and OSHA standards.

B. This section addresses identification of electrical equipment, raceways, boxes, conductors, and other related electrical system components.

1.2 SECTION INCLUDES

A. Identification for raceways and cables.

B. Identification of power conductors and control cables.

C. Identification of equipment and instructions.

D. Miscellaneous identification products.

1.3 REFERENCES

A. ANSI Z535.4: Standard for Product Safety Signs and Labels.

B. ANSI/IEEE C2: National Electrical Safety Code.

C. NFPA 70: National Electrical Code.

D. NFPA 70E: Standard for Electrical Safety in the Workplace.

E. OSHA 29 CFR 1910.144: Safety Color Code for Marking Physical Hazards.

F. OSHA 29 CFR 1910.145: Specifications for Accident Prevention Signs and Tags.

G. UL 969: Standard for Marking and Labeling Systems.

H. Definitions:

1. Circuit designation includes both equipment source and equipment position.

1.4 SUBMITTALS

A. Product data: For each type of electrical identification product.

1.5 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and IEEE C2.

B. Comply with NFPA 70.

C. Comply with OSHA standards.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.6 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in other sections requiring identification applications, drawings, shop drawings, manufacturer's wiring diagrams, and the operation and maintenance manual; and with those required by codes, standards, and safety regulations. Use consistent designations throughout Project.

B. Coordinate installation of identification materials and devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identification materials and devices with location of access panels and doors.

D. Install identifying materials and devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following manufacturers, or approved equal:

1. Brady USA, Inc.
2. Carlton Industries
3. Graphic Products, Inc.
4. Ideal Industries, Inc.
5. Panduit Corporation
6. Presco
7. Seton Identification Products
8. Thomas & Betts Company
9. Utility Safeguard

2.2 GENERAL PRODUCT REQUIREMENTS

A. Except where otherwise indicated, provide manufacturer's standard identification products of category and type suitable for each application. Where more than one identification method is specified for an application, the Installer shall select and utilize each material in a consistent manner.

2.3 RACEWAY IDENTIFICATION

A. Comply with ANSI A13.1 for minimum lettering size, length of color field, and coloring schemes for each raceway size, type, and location.

1. Colors: Black letters on Orange field.
2. Legend: Raceways carrying the following:

a. Power circuits less than 600V: Indicate system voltage.
b. Low-voltage systems less than 50V: Indicate system type (Example – "TELECOMMUNICATIONS".

B. Adhesive labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear weather- and chemical-resistant coating.

C. Color-coded, adhesive tape: Self-adhesive vinyl tape, in appropriate colors for system voltage and phase.

1. Exterior locations: Heavy-duty, waterproof, fade-resistant, suitable for outdoor use.

D. Wrap-around marker bands: Diameter sized to suit raceway or cable it identifies.

1. Plastic color-coded, pretensioned, grip-type, flexible, acrylic sleeve.
2. Aluminum, stamped or embossed legend, slotted for permanent securing.

2.4 CONDUCTOR AND CABLING IDENTIFICATION

A. Adhesive labels: Preprinted, flexible, self-adhesive vinyl with legend overlaminated with a clear weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

B. Color-coded, adhesive tape: Self-adhesive, vinyl tape, in appropriate colors for system voltage and phase.

C. Marker tapes: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

D. Wrap-around marker bands: Diameter sized to suit conductor or cable it identifies.

1. Plastic, color-coded, pretensioned, grip-type, flexible, acrylic sleeve.

2.5 EQUIPMENT IDENTIFICATION

A. Engraved plastic nameplates: Laminated plastic, engraved, white letters on black background, except where other color schemes are noted or specified.

1. Size: Minimum 19 mm (0.75-inch) by 64 mm (2.5-inches).
2. Letter size: Minimum height of 10 mm (0.375-inch).
3. Mechanically fastened.

a. Mechanical fastener: Punched or drilled, with vandalproof stainless steel or brass screws or rivets.

B. Adhesive film label: Machine-printed, black letters on white background, through thermal transfer or equivalent process, with clear weatherproof and UV-resistant covering. Minimum letter size height of 0.375-inch (10 mm).

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Wiring device tape labels:

1. Adhesive film label: Machine-printed, black letters on clear background, through thermal transfer or equivalent process. Minimum letter size height of 0.25-inch (6 mm).

a. Labeling for electrical devices and components such as receptacles, switches, control device stations, manual motor starters, network and phone jacks, junction and pull boxes, etc.

B. Warning labels and signs:

1. Self-adhesive warning labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configures for display on front cover, door, or other access to equipment unless otherwise noted.
2. Baked-enamel warning signs: Preprinted, aluminum signs, punched or drilled for fasteners with corner grommets; with colors, legend, and size required for application.
3. Fasteners: Self-tapping, stainless-steel screws or, stainless-steel machine screws with nuts, flat and lock washers.

C. Cable ties: Fungus-inert, self-extinguishing, one-piece, self-locking, color-coded, nylon cable ties suitable for the application (general purpose, UV-stabilized outdoor, or plenum rated).

D. Paint: Formulated for the type of surface, location, and intended use.

E. Stenciling: Nonfading, waterproof, ink or paint. Black or color-coded.

F. Adhesive: Heavy-duty, thermo-resistant, industrial grade adhesive, for adhesion to any surface without identification curling, peeling, or falling off.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification products at locations for most convenient viewing without interference with operation and maintenance of equipment.

1. For finished public spaces, coordinate identification product mounting locations with COTR.

C. Existing equipment: Apply identification products to unmarked existing equipment where work is being performed.

D. Apply identification products to surfaces after equipment finish work has been completed.

E. Clean surfaces before applying identification products, using materials and methods recommended by manufacturer of identification device.

F. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

G. System identification labeling for telecommunications raceways and cables: Each label shall be installed on sidewall of conduit and easily placed for proper identification. Locate labels at changes in direction, at penetrations of walls and floors, at 15 meter (50-foot) maximum intervals in straight runs, and at 7.6-meter (25-foot) maximum intervals in congested areas.

H. System identification color-coding bands for raceways and cables: Each color-coding band shall completely encircle cable or raceway. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 15-meter (50-foot) maximum intervals in straight runs, and at 7.6-meter (25-foot) maximum intervals in congested areas.

I. Aluminum wraparound marker labels and metal tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.

J. Cable ties: For attaching tags, use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
2. In spaces handling environmental air: Plenum rated.

K. Painted identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 APPLICATION

A. Miscellaneous:

1. Access doors and panels: Apply engraved nameplate labels at access doors identifying concealed electrical item. Do not locate labels in finished, public spaces.

B. Junction and pull boxes:

1. Label each junction and pull box, identifying circuit designation or type of system.

   a. Exposed boxes: Place label on coverplate, externally visible.
   b. Concealed boxes: Place label or tag on inside cover of box.
   c. Junction boxes concealed above suspended ceilings or exposed in non-occupied spaces may be marked with permanent ink marker in lieu of printed labels.

2. Boxes with conductors greater than 600V: Apply labels identifying nominal system voltage on cover and minimum of one fixed side. One label shall be visible from the floor where boxes are installed exposed.
3. Fire alarm system boxes shall have red finish. Boxes shall be prefinished prior to installation.

C. Raceway identification: Apply identification products for each raceway.

1. Apply color-coded identification products to raceways as follows:

   a. Normal power system: None.
   b. Standby and emergency power systems: Orange.
   c. Fire alarm system: Red, solid colored.
   d. Security System: Blue, color banded.

2. Apply labels identifying nominal system voltage for the raceways containing feeders and raceways larger than 53-mm (2-inch) with power conductors.
3. Apply system identification labels identifying type of system for low-voltage telecommunications system raceways.
4. Apply circuit designation markings on each feeder and branch circuit raceway entering and leaving each panelboard and switchboard. Mark raceway clearly with permanent ink marker or printed labels.
5. Empty raceways: Apply labels indicating description of empty raceways (i.e., spare, future use) and identifying the beginning and end locations. Mark raceway clearly with permanent ink marker or printed labels.
6. Abandoned raceways: Apply labeling indicating raceway has been abandoned.

D. Wiring and cabling identification:

1. Power circuit conductor identification, 600 volts or less: Apply color-coded identification for cables, feeders, and power circuit conductors exposed in accessible vaults, junction and pull boxes, utility structures, and equipment enclosures. Apply color-coding scheme as indicated below throughout the building's network of feeders and circuits, unless otherwise required by the authority having jurisdiction.

   a. Colors on conductors No. 10 and smaller, or No. 6 and smaller for grounded and grounding conductors: Solid colored insulation.
   b. Colors on conductors No. 8 and larger, or No. 4 and larger for grounded and grounding conductors: Apply colored tape wrapped a minimum of 6 inches (150 mm) on either end of conductor and in boxes where splices or taps are made.
   c. Conductors used solely for grounding purposes shall be green, if insulated. [Isolated ground conductors shall be green with a yellow strip.]
   d. Where multi-conductor cables are used, use same color coding system for identification of wiring.

COLOR CODE (600 volts maximum)				
VOLTAGE	NEUTRAL	PHASE		
		A	B	C
120 volts, 2-wire	White	Black, Red, or Blue depending on phase		
277 volts, 2-wire	Gray	Brown, Orange, or Yellow depending on phase		
208 volts, single-phase, 2-wire		Black/Red, Red/Blue, or Blue/Black		
208/120 volts wye, 3-phase, 4-wire	White	Black	Red	Blue
480/277 volts wye, 3-phase, 4-wire	Gray	Brown	Orange	Yellow
480 volts delta, 3-phase, 3-wire		Brown	Orange	Yellow

2. Conductors for future use: Attach tags with circuit designation for conductors to be extended for future use.
3. Control and low-voltage system wiring shall be coded with colors and markings different from those used to designate phase wires.

E. Wiring device labels: For wiring devices such as receptacles, devices installed in surface raceway assemblies, and other wiring devices operating at or greater than 120V.

1. Apply adhesive film labels on inside of wiring device coverplates identifying circuit designation serving device.
2. For special receptacle configurations, apply label identifying applicable device NEMA configuration designation in location not concealed by plug.
3. Apply labels to devices serving low-voltage system devices including the following:

a. Fire alarm devices and test stations: Circuit designation.
b. Telecommunications device stations: Work area outlet designation.
c. Audio-visual device stations: Device designation.
d. Security device stations: Device designation.]

F. Equipment identification: Install unique designation label consistent with contract documents and shop drawings.

1. Labeling instructions:

a. Engraved plastic laminate nameplates, unless otherwise indicated.
b. Unless otherwise required, provide a single line of text with 13 mm (0.5-inch) high lettering on 38 mm (1.5-inch) high label. Where two or more lines are required, use single label with increased height.
c. For multi-section or multi-compartment equipment, apply labels identifying each compartment or section.
d. For fusible equipment, identify fuse type and size on the front cover.
e. For enclosed circuit breaker equipment, identify device trip rating where rating is not visible.
f. Where equipment has more than one source of power (i.e., transfer switch, separate control power source), the location and circuit designation of each power source shall be clearly identified at the equipment location.

2. Apply nameplates and labels to equipment according to the below identification schemes:

a. Identify equipment designation; voltage rating; phase and number of wires; and designation and location of load served. Apply products to the following equipment:

(1) Panelboards
(2) Switchboards

b. Identify equipment designation; primary and secondary voltage ratings; phase and number of wires; circuit designation and location of primary source; and designation and location of load served. Apply products to the following equipment:

(1) Enclosed switches (disconnects/safety switches)
(2) Enclosed circuit breakers

(3) Contactors
(4) Motor starters and combination motor starter-disconnects
(5) Variable frequency drives
(6) Transformers

c. Identify equipment designation; voltage rating; phase and number of wires; and capacity rating. Apply products to the following equipment:

(1) Transfer switches: Capacity rating in amperes; identify the location and circuit designation of each power source at the equipment location.

d. Identify equipment designation; and circuit designation and location of primary source. Apply products to the following equipment:

(1) Monitoring and control equipment
(2) Control stations
(3) Fire alarm control panels and auxiliary equipment
(4) Security panels and auxiliary equipment

3. Nameplates shall incorporate white lettering on colored backgrounds based on the following color-coding scheme:

a. Normal power system: Black background.
b. Emergency or standby power system: Red background.

4. Caulk and seal all holes drilled in enclosures for the purpose of mounting nameplates.

G. Warning and caution labels and signs:

1. Apply warning and caution labels and signs at locations where safe operation and maintenance of electrical system equipment is of concern.

3.3 FIELD QUALITY CONTROL

A. Coordinate names, abbreviations, colors, and other designations with construction documents, submittals, and applicable code and standards requirements. Utilize consistent designations and identification techniques throughout project.

B. Install identification products at locations that are clearly visible at normal viewing angles and without interference with operation and maintenance of the equipment.

C. Install identification products in a neat and clean, professional manner where products are securely attached and oriented parallel to equipment edges.

END OF SECTION 260553

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Receptacles.

B. Terminal blocks.

1.2 RELATED SECTIONS

A. Boxes: Section 260534.

B. Identification: Section 260553.

1.3 REFERENCES

A. ANSI/NEMA WD 6: Wiring Devices - Dimensional Specifications.

B. NEMA WD 1: General Color Requirements for Wiring Devices.

C. UL 498: Attachment Plugs and Receptacles.

1.4 SUBMITTALS

A. Product data: Each type of device used in the project.

B. Field quality-control test reports.

PART 2 - PRODUCTS

2.1 RECEPTACLES

A. Acceptable manufacturers:

1. Arrow Hart/Eaton Wiring Devices
2. Hubbell/Bryant Electric
3. Legrand/Pass & Seymour (P&S)
4. Leviton Manufacturing Co.

B. Receptacles: NEMA 5-20R, 20-ampere rating, 125 volts AC, 2-pole, 2-wire plus ground, conforming to NEMA WD 1 and WD 6 configuration numbers, and UL 498.

1. Specification grade:

a. General-use, duplex.

(1) Basis of design: P&S PS5362, heavy-duty, brass mounting strap.

b. Ground-fault circuit-interrupter (GFCI) type for exterior and wet locations, duplex:

(1) Basis of design: P&S 2097TRWR, tamper-resistant, weather-resistant.

C. Device colors:

1. Normal power receptacles: White.
2. Generator power receptacles: Red.

D. Device covers:

1. Wet-location, weatherproof cover, single-gang, extra-duty:

a. Basis of design: P&S WIUCAST1, while-in-use, cast aluminum.

2.2 TERMINAL BLOCKS

A. Terminal blocks: Screw-terminal type, size as required by NFPA 70, NEMA 250 Type 4X enclosure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices in complete compliance with the manufacturer’s recommendations.

B. Arrangement of devices: Unless otherwise indicated, mount flush with long dimension vertical. Group adjacent devices under single multi-gang wall plates.

C. Receptacles:

1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.

D. Wall plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard wall plates do not fit flush or do not cover rough wall opening.

3.2 IDENTIFICATION

A. Comply with Section 260553 "Identification for Electrical Systems."

B. Identify receptacles with panelboard identification and circuit number. Use durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and inspections:

1. After installing devices and after electrical circuitry has been energized, test for compliance with requirements.
2. Receptacles:

    a. Insert and remove test plug to verify that device is securely mounted.
    b. Verify polarity of hot and neutral pins.
    c. Measure line voltage.
    d. Measure grounding circuit continuity; impedance shall be not greater than 2 ohms.

C. Correct malfunctioning devices on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new devices and retest.

D. Report results of tests and inspections in writing.

END OF SECTION 262726

SECTION 264113 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Modification to the existing facility lightning protection system including removal, relocation, and/or addition of new system components and system inspection.

1.2 RELATED SECTIONS

A. Conduit: Section 260533.

B. Grounding: Section 260526.

1.3 REFERENCES

A. NFPA 780: Installation of Lightning Protection Systems.

B. UL 96: Lightning Protection Components.

C. UL 96A: Installation Requirements for Lightning Protection Systems.

1.4 DEFINITIONS

A. NRTL: Nationally recognized testing laboratory.

1.5 SUBMITTALS

A. Shop drawings: For air terminals and mounting accessories.

1. Detail lightning protection system, including air-terminal locations, conductor routes and connections, and bonding and grounding provisions.
2. Indicate use of raceway, and provide data on how concealment requirements will be met and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.
3. Provide scaled drawings of proposed layout.

B. Product data: For each type of product specified, including roof adhesive, if used, submit evidence to establish that materials are manufactured, furnished, and recommended for their intended use by a lightning protection manufacturer who is a Manufacturer Member of the Lightning Protection Institute.

C. Qualification data: For firms and persons specified in “Quality Assurance” article. Include data on listing or certification by an NRTL.

D. Certifications:

1. Certificate signed by Contractor stating roof adhesive for air terminals is approved by manufacturers of both the terminal assembly and the single-ply membrane roofing material.
2. Certifications required by “Field Quality Control” in Part 3 below.

E. Reports: Tests and inspections required by “Field Quality Control” in Part 3 below.

F. Project records:

1. Drawing: As required by Division 01 and Section 260101, at the same scale as contract documents, showing the actual locations of air terminals, cable routes, connections and grounding, and other components installed; to be made part of Operation and Maintenance manuals.
2. Forms and final documentation as required in “Field Quality Control” in Part 3 below.
3. Photo documentation of concealed portions of the lightning protection system as they are installed such as structural steel connections.

1.6 QUALITY ASSURANCE

A. Install system under the supervision of the manufacturer’s authorized and approved representative qualified as follows:

1. Actively engaged in the installation of lightning protection systems.
2. Having a satisfactory record of performance, including providing adequate service, as demonstrated by at least 5 systems of the same type, and similar size and duty, which have performed for not less than 2 years.

B. Electrical components, devices, and accessories: Comply with applicable requirements of NFPA 70.

C. Comply with NFPA 780, UL 96, and UL 96A.

1.7 COORDINATION

A. Coordinate installation of lightning protection with installation of other building systems and components, including electrical wiring, supporting structures and building materials, metal bodies requiring bonding to lightning protection components, and building finishes.

B. Coordinate installation of air terminals attached to roof systems with roofing manufacturer and Installer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Manufacturers/Installers: Subject to compliance with requirements, provide products by one of the following:

1. Advanced Lightning Systems, Inc.
2. Bonded Lighting Protection Systems, Inc.
3. Brazill Brothers & Associates, Inc.
4. Dillon Lightning Protection Systems, Inc.
5. East Coast Lightning Equipment, Inc.
6. Heary Bros. Lightning Protection Co. Inc.
7. Thompson Lightning Protection, Inc.

2.2 LIGHTNING PROTECTION SYSTEM COMPONENTS

A. Comply with UL 96.

B. Air terminals and conductors: Class 1 NFPA 780 solid copper or aluminum unless otherwise indicated.

1. Air terminals: Blunt end. Air terminals shall be approved by COTR prior to installation.
2. Stack-mounting air terminals: Solid copper.
3. Air terminals installed on single-ply roof membrane: Designed for this application.

C. Through-roof and through-wall connectors: Assembly for conductors passing through roof or wall penetrations to facilitate water-tight seal.

D. Lightning Protection on Equipment: Provide materials that are appropriate for the mounting surface (aluminum for aluminum surfaces, and for other surfaces copper or bronze), and of the size, weight, and construction to suit the application and used in accordance with UL and NFPA code requirements. Use bolt type connectors and splicers. Pressure squeeze clamps are not acceptable. Mounting hardware shall be stainless steel to prevent corrosion

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not begin work until shop drawings have been approved. Notify COTR 24 hours in advance of concealing lightning protection work.

B. Install lightning protection components and systems in accordance with NFPA 780 and UL 96A.

C. Install conductors with direct horizontal and downward paths from air terminals to ground connections. Avoid sharp bends and narrow loops; make no bends sharper than 90 degrees and minimum bending radius of 203 mm (8 inches).

D. Air terminals shall extend not less than 255 mm (10 inches) above the objects they are to protect.

1. Air terminals on single-ply membrane roofing: Comply with adhesive manufacturer’s written instructions.

E. Structural steel framing elements may be used in lieu of down conductors at intervals not exceeding 100-feet around perimeter of the building or structure. Ensure continuity of steel framing and bond to lightning protection ground electrode system.

3.2 CORROSION PROTECTION

A. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

B. Install conductors with protective coatings where conditions would cause deterioration or corrosion of conductors.

3.3 GROUNDING AND BONDING

A. Provide equipment grounding and bonding connections sufficiently tight to ensure permanent and effective grounds and bonds.

3.4 FIELD QUALITY CONTROL

A. Testing: Perform ground resistance test before and after installation. Submit a copy of the results. Existing and modified system ground resistance shall not exceed 10-ohms. Test, correct, and retest until results are satisfactory.

B. Inspection: Provide an inspection by a UL field inspector certified by UL. The system is to be inspected for compliance with NFPA 780 and UL 96A.

C. Inspection documents: The facility maintains an existing UL Master Certificate. This project renovation requires limited modifications to the existing lightning protection system. Submit a UL Letter of Findings to confirm compliance with the limited scope of inspection.

END OF SECTION 264113