

**DEPARTMENT OF VETERANS AFFAIRS
 VHA MASTER SPECIFICATIONS**

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Louis A. Johnson VAMC
 Replace Roof Main Building & Clinical Addition
 Clarksburg, WV 26301

April 7, 2016
 100% Bid Documents
 Project No. 540-13-308
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SECTION 00 01 15
LIST OF DRAWING SHEETS

The drawings listed below accompanying this specification form a part of
the contract.

<u>Drawing No.</u>	<u>Title</u>
GI001	Cover Sheet
GI100	Legends & Abbreviations

ARCHITECTURAL

AS100	Site Plan
AS101	Level 1 & 2 Roof Plans
AS102	Level 3 Roof Plans
AS103	Level 4 Roof Plans
AS104	Level 6 & 7 Roof Plans
AS500	Typical Details
AS501	Typical Details

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

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approach to following goals and maintaining confidentiality of "sensitive information".

2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.

police, be identified by project and employer, and restricted from unauthorized access.

1.3 STATEMENT OF BID ITEM(S)

- A. ITEM I, GENERAL CONSTRUCTION: Replace roofing, with single ply membrane roof, insulation and complete roof system, roof restoration and associated roof drains, down spouts, mechanical, electrical and fire protection connections.
- B. ALTERNATE NO.1: ELIMINATE DEMOLITION & REMOVAL OF EXISTING EPDM ROOFING ASSEMBLY. ELIMINATE INSTALLATION OF NEW, COVER BOARD, EPDM MEMBRANE AND ASSOCIATED WORK WITHIN AREA INDICATED AS ALTERNATE NO. 1 ON LEVEL 6.
- C. ALTERNATE NO. 2: ELIMINATE DEMOLITION & REMOVAL OF EXISTING EPDM ROOFING ASSEMBLY. ELIMINATE INSTALLATION OF NEW, COVER BOARD, EPDM MEMBRANE AND ASSOCIATED WORK WITHIN AREA INDICATED AS ALTERNATE NO. 2, ON LEVEL 6.
- D. ALTERNATE NO. 3: ELIMINATE FLUID APPLIED URETHANE RESTORATION TREATMENT AS INDICATED AS ALTERNATE NO. 3, ON LEVEL 4.
- E. ALTERNATE NO. 4: ELIMINATE DEMOLITION & REMOVAL OF EXISTING EPDM ROOFING ASSEMBLY. ELIMINATE INSULATION OF NEW, COVER BOARD, EPDM MEMBRANE AND ASSOCIATED WORK WITHIN INDICATED AREA AS ALTERNATE NO. 4, ON LEVEL 2. ELIMINATE DEMOLITION & REMOVAL OF ANY ABANDONED ROOF CURBS, ABANDONED ROOF HATCHES, AND ABANDONED LOUVERS INDICATED AS PART OF THE WORK. ABANDONED ROOF CURBS, ROOF HATCHES, AND ABANDONED LOUVERS WILL REMAIN AS MODIFIED OR COVERED BY ROOFING MEMBRANE REPLACEMENT/INSTALLATION.

1.4 SPECIFICATIONS AND DRAWINGS FOR CONTRACTOR

- A. Drawings and contract documents may be obtained from the website where the solicitation is posted. Additional copies will be at Contractor's expense.

1.5 CONSTRUCTION SECURITY REQUIREMENTS

A. Security Plan:

1. The security plan defines both physical and administrative security procedures that will remain effective for the entire duration of the project.
2. The General Contractor is responsible for assuring that all sub-contractors working on the project and their employees also comply with these regulations.

B. Security Procedures:

1. General Contractor's employees shall not enter the project site without appropriate badge. They may also be subject to inspection of their personal effects when entering or leaving the project site.
2. Before starting work the General Contractor shall give one week's notice to the Contracting Officer so that security escort and/or arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this section.
3. No photography of VA premises is allowed without written permission of the Contracting Officer Representative.
4. VA reserves the right to close down or shut down the project site and order General Contractor's employees off the premises in the event of a national emergency. The General Contractor may return to the site only with the written approval of the Contracting Officer.

C. Key Control:

1. The General Contractor shall provide duplicate keys and lock combinations to the Contracting officers representative (COR) for the purpose of security inspections of every area of project including tool boxes and parked machines and take any emergency action.
2. The General Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation.

D. Document Control:

1. Before starting any work, the General Contractor/Sub Contractors shall submit an electronic security memorandum describing the approach to following goals and maintaining confidentiality of "sensitive information".
2. The General Contractor is responsible for safekeeping of all drawings, project manual and other project information. This information shall be shared only with those with a specific need to accomplish the project.
3. Certain documents, sketches, videos or photographs and drawings may be marked "Law Enforcement Sensitive" or "Sensitive Unclassified". Secure such information in separate containers and limit the access to only those who will need it for the project. Return the information to the Contracting Officer upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer.
5. All paper waste or electronic media such as CD's and diskettes shall be shredded and destroyed in a manner acceptable to the VA.
6. Notify Contracting Officer and Site Security Officer immediately when there is a loss or compromise of "sensitive information".
7. All electronic information shall be stored in specified location following VA standards and procedures using an Engineering Document Management Software (EDMS).
 - a. Security, access and maintenance of all project drawings, both scanned and electronic shall be performed and tracked through the EDMS system.
 - b. "Sensitive information" including drawings and other documents may be attached to e-mail provided all VA encryption procedures are followed.

E. Motor Vehicle Restrictions

1. Vehicle authorization request shall be required for any vehicle entering the site and such request shall be submitted 24 hours before the date and time of access. Access shall be restricted to picking up and dropping off materials and supplies.
2. A limited number of (2 to 5) permits shall be issued for General Contractor and its employees for parking in designated areas only.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer. The Contractor shall hold and save the Government, its officers and agents, free and harmless from liability of any nature occasioned by the Contractor's performance.
- B. Temporary buildings (e.g., storage sheds, shops, offices) and utilities may be erected by the Contractor only with the approval of the Contracting Officer and shall be built with labor and materials furnished by the Contractor without expense to the Government. The temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor at its expense upon completion of the work. With the written consent of the Contracting Officer, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, under regulations prescribed by the Contracting Officer, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law or regulation. When it is necessary to cross curbs or sidewalks, the Contractor shall protect them from damage. The Contractor shall repair or pay for the repair of any damaged curbs, sidewalks, or roads.

(FAR 52.236-10)

- D. Working space and space available for storing materials shall be as shown on the drawings and directed by COR.
- E. Workmen are subject to rules of Medical Center applicable to their conduct.
- F. Execute work so as to interfere as little as possible with normal functioning of Medical Center as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others. Use of equipment and tools that transmit vibrations and noises through the building structure, are not permitted in buildings that are occupied, during construction, jointly by patients or medical personnel, and Contractor's personnel, except as permitted by COR where required by limited working space.
1. Do not store materials and equipment in other than assigned areas.
 2. Schedule delivery of materials and equipment to immediate construction working areas within buildings in use by Department of Veterans Affairs in quantities sufficient for not more than two work days. Provide unobstructed access to Medical Center areas required to remain in operation.
 3. Where access by Medical Center personnel to vacated portions of buildings is not required, storage of Contractor's materials and equipment will be permitted subject to fire and safety requirements.
- G. Utilities Services: Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems (except telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Contracting Officer Representative (COR). All such actions shall be coordinated with the COR or Utility Company involved:
1. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.

H. Phasing:

The Medical Center must maintain its operation 24 hours a day 7 days a week. Therefore, any interruption in service must be scheduled and coordinated with the COR to ensure that no lapses in operation occur. It is the CONTRACTOR'S responsibility to develop a work plan and schedule detailing, at a minimum, the procedures to be employed, the equipment and materials to be used, the interim life safety measure to be used during the work, and a schedule defining the duration of the work with milestone subtasks. The work to be outlined shall include, but not be limited to:

To insure such executions, Contractor shall furnish the COR with a schedule of approximate phasing dates on which the Contractor intends to accomplish work in each specific area of site, building or portion thereof. In addition, Contractor shall notify the COR two weeks in advance of the proposed date of starting work in each specific area of site, building or portion thereof. Arrange such phasing dates to insure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, COR and Contractor, as indicated on drawings

Phase I: Mobilization, stockpiling and establishment of construction zone fence and safety measures. Replace roof of main building, level 5 and above as indicated

Phase II: Provide roof recover/restoration through fluid applied coating as indicated,

Phase III: Replace roof of Clinical Addition, level 3 and above, as indicated.

Phase IV: Replace roof and provide cleaned, repaired, reinstalled, or replaced coping, flashing and trim for level 2 and below and also remaining project work areas indicated.

- H. Building(s) No.(s) 1 and Clinical Addition will be occupied during performance of work; but immediate areas of alterations will be vacated.
- I. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, 2.1m (seven feet)

minimum height, around the construction area indicated on the drawings. Provide gates as required for access with necessary hardware, including hasps and padlocks. Fasten fence fabric to terminal posts with tension bands and to line posts and top and bottom rails with tie wires spaced at maximum 375mm (15 inches). Bottom of fences shall extend to 25mm (one inch) above grade. Remove the fence when directed by COR.

K. Utilities Services: Maintain existing utility services for Medical Center at all times. Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing water, steam, gases, sewer or air pipes, or conduits, wires, cables, etc. of utility services or of fire protection systems and communications systems (including telephone), they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by COR.

1. No utility service such as water, gas, steam, sewers or electricity, or fire protection systems and communications systems may be interrupted without prior approval of COR [Chief Engineer][Chief of Facilities Management]. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished, work on any energized circuits or equipment shall not commence without a detailed work plan, the Medical Center Director's prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.
2. Contractor shall submit a request to interrupt any such services to COR, in writing, 7 days in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption.
3. Contractor will be advised (in writing) of approval of request, or of which other date and/or time such interruption will cause least inconvenience to operations of Medical Center. Interruption time

- approved by Medical Center may occur at other than Contractor's normal working hours.
4. Major interruptions of any system must be requested, in writing, at least 15 calendar days prior to the desired time and shall be performed as directed by the COR.
 5. In case of a contract construction emergency, service will be interrupted on approval of COR. Such approval will be confirmed in writing as soon as practical.
 6. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service to the construction project, for such items as water, sewer, electricity, gas or steam, payment of such fee shall be the responsibility of the Government and not the Contractor.
- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged at the main, branch or panel they originate from. The lines shall not be capped in finished areas, but shall be removed and sealed, capped or plugged in ceilings, within furred spaces, in unfinished areas, or within walls or partitions; so that they are completely behind the finished surfaces.
- M. To minimize interference of construction activities with flow of Medical Center traffic, comply with the following:
1. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new utility lines cross existing roads, at least one lane must be open to traffic at all times with approval.
 2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.

- N. Coordinate the work for this contract with other construction operations as directed by COR. This includes the scheduling of traffic and the use of roadways, as specified in Article, USE OF ROADWAYS.
- O. Coordination of Construction with Cemetery Director: The burial activities at a National Cemetery shall take precedence over construction activities. The Contractor must cooperate and coordinate with the Cemetery Director, through the COR, in arranging construction schedule to cause the least possible interference with cemetery activities in actual burial areas. Construction noise during the interment services shall not disturb the service. Trucks and workmen shall not pass through the service area during this period:
1. The Contractor is required to discontinue his work sufficiently in advance of Easter Sunday, Mother's Day, Father's Day, Memorial Day, Veteran's Day and/or Federal holidays, to permit him to clean up all areas of operation adjacent to existing burial plots before these dates.
 2. Cleaning up shall include the removal of all equipment, tools, materials and debris and leaving the areas in a clean, neat condition.

1.7 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed and from demolition of buildings or structures, or parts thereof, shall be disposed of as follows:
1. Reserved items which are to remain property of the Government are identified by attached tags as items to be stored. Items that remain property of the Government shall be removed or dislodged from present locations in such a manner as to prevent damage which would be detrimental to re-installation and reuse. Store such items where directed by COR.
 2. Items not reserved shall become property of the Contractor and be removed by Contractor from Medical Center.

3. Items of portable equipment and furnishings located in rooms and spaces in which work is to be done under this contract shall remain the property of the Government. When rooms and spaces are vacated by the Department of Veterans Affairs during the alteration period, such items which are NOT required by drawings and specifications to be either relocated or reused will be removed by the Government in advance of work to avoid interfering with Contractor's operation.

a. Copies of the following listed CFR titles may be obtained from the Government Printing Office:

40 CFR 261.....Identification and Listing of Hazardous Waste

40 CFR 262.....Standards Applicable to Generators of Hazardous Waste

40 CFR 263.....Standards Applicable to Transporters of Hazardous Waste

40 CFR 761.....PCB Manufacturing, Processing, Distribution in Commerce, and use Prohibitions

49 CFR 172.....Hazardous Material tables and Hazardous Material Communications Regulations

49 CFR 173.....Shippers - General Requirements for Shipments and Packaging

49 CFR 173.....Subpart A General

49 CFR 173.....Subpart B Preparation of Hazardous Material for Transportation

49 CFR 173.....Subpart J Other Regulated Material; Definitions and Preparation

TSCA.....Compliance Program Policy Nos. 6-PCB-6 and 6-PCB-7

1.8 PROTECTION OF EXISTING STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment, and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so, and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer.
- B. The Contractor shall protect from damage all existing improvements and utilities at or near the work site and on adjacent property of a third party, the locations of which are made known to or should be known by the Contractor. The Contractor shall repair any damage to those facilities, including those that are the property of a third party, resulting from failure to comply with the requirements of this contract or failure to exercise reasonable care in performing the work. If the Contractor fails or refuses to repair the damage promptly, the Contracting Officer may have the necessary work performed and charge the cost to the Contractor.

(FAR 52.236-9)

- C. Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS, for additional requirements on protecting vegetation, soils and the environment. Refer to Articles, "Alterations", "Restoration", and "Operations and Storage Areas" for additional instructions concerning repair of damage to structures and site improvements.

1.9 RESTORATION

- A. Remove, cut, alter, replace, patch and repair existing work as necessary to install new work. Except as otherwise shown or specified, do not cut, alter or remove any structural work, and do not disturb any ducts, plumbing, steam, gas, or electric work without approval of the COR. Existing work to be altered or extended and that is found to be defective in any way, shall be reported to the COR before it is

disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.

- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone) which are not scheduled for discontinuance or abandonment.
- D. Expense of repairs to such utilities and systems not shown on drawings or locations of which are unknown will be covered by adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.10 LAYOUT OF WORK

- A. The Contractor shall lay out the work from Government established base lines and bench marks, indicated on the drawings, and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all templates, platforms, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines and grades that may be established or indicated by the Contracting Officer. The Contractor shall also be responsible for maintaining and preserving all stakes and other marks established by the Contracting Officer until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor.

(FAR 52.236-17)

- B. During progress of work, and particularly as work progresses from floor to floor, Contractor shall have line grades and plumbness of all major form work checked and certified by a registered land surveyor or registered civil engineer as meeting requirements of contract drawings. Furnish such certification to the COR before any major items of concrete work are placed. In addition, Contractor shall
- C. Whenever changes from contract drawings are made record such changes on a reproducible drawing and forward these drawings upon completion of work to COR.
- D. Upon completion of the work, the Contractor shall furnish the COR one electronic copy and reproducible drawings at the scale of the contract drawings, showing the finished slope at all walls and parapets and indicate all peaks and valleys.
- E. The Contractor shall perform the surveying and layout work of this and other articles and specifications in accordance with the provisions of Article "Professional Surveying Services".

1.11 AS-BUILT DRAWINGS

- A. The contractor shall maintain two full size sets of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the COR review, as often as requested.
- C. Contractor shall deliver two approved completed sets of as-built drawings in the electronic version (scanned PDF) to the COR and Facilities Management within 15 calendar days after each completed phase and after the acceptance of the project by the COR.
- D. Paragraphs A and B shall also apply to all shop drawings.

1.12 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on Medical Center property and, when authorized by the COR, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed and restoration performed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed bridges.
- B. When new permanent roads are to be a part of this contract, Contractor may construct them immediately for use to facilitate building operations. These roads may be used by all who have business thereon within zone of building operations.
- C. When certain buildings (or parts of certain buildings) are required to be completed in advance of general date of completion, all roads leading thereto must be completed and available for use at time set for completion of such buildings or parts thereof.

1.13 TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Use of new installed mechanical and electrical equipment to provide heat, ventilation, plumbing, light and power will be permitted subject to written approval and compliance with the following provisions:
 - 1. Permission to use each unit or system must be given by COR in writing. If the equipment is not installed and maintained in accordance with the written agreement and following provisions, the COR will withdraw permission for use of the equipment.
 - 2. Electrical installations used by the equipment shall be completed in accordance with the drawings and specifications to prevent damage to the equipment and the electrical systems, i.e. transformers, relays, circuit breakers, fuses, conductors, motor controllers and their overload elements shall be properly sized, coordinated and adjusted. Installation of temporary electrical equipment or devices shall be in accordance with NFPA 70, National Electrical Code, (2014 Edition), Article 590, *Temporary Installations*. Voltage supplied to each item of equipment shall be verified to be correct and it shall be determined that motors are not overloaded. The electrical

equipment shall be thoroughly cleaned before using it and again immediately before final inspection including vacuum cleaning and wiping clean interior and exterior surfaces.

3. Units shall be properly lubricated, balanced, and aligned. Vibrations must be eliminated.
 4. Automatic temperature control systems for preheat coils shall function properly and all safety controls shall function to prevent coil freeze-up damage.
 5. The air filtering system utilized shall be that which is designed for the system when complete, and all filter elements shall be replaced at completion of construction and prior to testing and balancing of system.
 6. All components of heat production and distribution system, metering equipment, condensate returns, and other auxiliary facilities used in temporary service shall be cleaned prior to use; maintained to prevent corrosion internally and externally during use; and cleaned, maintained and inspected prior to acceptance by the Government.
- B. Prior to final inspection, the equipment or parts used which show wear and tear beyond normal, shall be replaced with identical replacements, at no additional cost to the Government.
- C. This paragraph shall not reduce the requirements of the mechanical and electrical specifications sections.
- D. Any damage to the equipment or excessive wear due to prolonged use will be repaired replaced by the contractor at the contractor's expense.

1.14 TEMPORARY USE OF EXISTING ELEVATORS

- A. Contractor will not be allowed the use of existing elevators. Outside type hoist shall be used by Contractor for transporting materials and equipment.
- A*. Use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:

1. Contractor makes all arrangements with the COR for use of elevators. The COR will ascertain that elevators are in proper condition. Contractor may use elevators in Building Nos. 1 and the Clinical addition for daily use between the hours of 7 AM and 6 PM and for special nonrecurring time intervals when permission is granted. Personnel for operating elevators will not be provided by the Department of Veterans Affairs.
2. Contractor covers and provides maximum protection of following elevator components:
 - a. Entrance jambs, heads soffits and threshold plates.
 - b. Entrance columns, canopy, return panels and inside surfaces of car enclosure walls.
 - c. Finish flooring.
3. Government will accept hoisting ropes of elevator and rope of each speed governor if they are worn under normal operation. However, if these ropes are damaged by action of foreign matter such as sand, lime, grit, stones, etc., during temporary use, they shall be removed and replaced by new hoisting ropes at the contractors' expense.
4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced by new brake lining at the contractors' expense.
5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts at the contractors' expense, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer.

1.21 AVAILABILITY AND USE OF UTILITY SERVICES

- A. The Government shall make all reasonably required amounts of utilities available to the Contractor from existing outlets and supplies, as specified in the contract. The amount to be paid by the Contractor for chargeable electrical services shall be the prevailing rates charged to the Government. The Contractor shall carefully conserve any utilities furnished without charge.
- B. The Contractor, at Contractor's expense and in a workmanlike manner, in compliance with code and as satisfactory to the Contracting Officer, shall install and maintain all necessary temporary connections and distribution lines, and all meters required to measure the amount of electricity used for the purpose of determining charges. Before final acceptance of the work by the Government, the Contractor shall remove all the temporary connections, distribution lines, meters, and associated paraphernalia and repair restore the infrastructure as required.
- C. Contractor shall install meters at Contractor's expense and furnish the Medical Center a monthly record of the Contractor's usage of electricity as hereinafter specified.
- D. Heat: Furnish temporary heat necessary to prevent injury to work and materials through dampness and cold. Use of open salamanders or any temporary heating devices which may be fire hazards or may smoke and damage finished work, will not be permitted. Maintain minimum temperatures as specified for various materials:
1. Obtain heat by connecting to Medical Center heating distribution system.
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the Medical Center electrical distribution system. The Contractor shall meter and pay for electricity required for electric cranes and hoisting devices, electrical welding devices and any electrical heating devices

providing temporary heat. Electricity for all other uses is available at no cost to the Contractor.

F. Water (for Construction and Testing): Furnish temporary water service.

1. Obtain water by connecting to the Medical Center water distribution system. Provide reduced pressure backflow preventer at each connection as per code. Water is available at no cost to the Contractor.
2. Maintain connections, pipe, fittings and fixtures and conserve water-use so none is wasted. Failure to stop leakage or other wastes will be cause for revocation (at COR discretion) of use of water from Medical Center's system.

1.23 TESTS

- A. As per specification section 23 05 11 the contractor shall provide a written testing procedure and plan for any HVAC equipment shutdown (temporarily) or disassembled to any degree. The plan will provide a schedule and a written sequence of what will be tested, how and what the expected outcome will be. This document will be submitted for approval prior to commencing work. The contractor shall document the results of the approved plan and submit for approval with the as built documentation.
- B. Pre-test mechanical and electrical equipment and systems and make corrections required for proper operation of such systems before requesting final tests. Final test will not be conducted unless pre-tested.
- C. Conduct final tests required in various sections of specifications in presence of the Contracting Officer. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- D. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire system which must be coordinated to work together during normal operation to produce results for which the system is designed. For example, air conditioning supply

air is only one part of entire system which provides comfort conditions for a building. Other related components are return air, exhaust air, steam, chilled water, refrigerant, hot water, controls and electricity, etc. Another example of a system which involves several components of different disciplines is a boiler installation. Efficient and acceptable boiler operation depends upon the coordination and proper operation of fuel, combustion air, controls, steam, feedwater, condensate and other related components.

- E. All related components as defined above shall be functioning when any system component is tested. Tests shall be completed within a reasonable period of time during which operating and environmental conditions remain reasonably constant and are typical of the design conditions.
- F. Individual test result of any component, where required, will only be accepted when submitted with the test results of related components and of the entire system.

1.24 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating manuals (hard copies and electronic) and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and operating manuals and one compact disc (four hard copies and one electronic copy each) for each separate piece of equipment (that was moved or disassembled to any degree for the work) shall be delivered to the COR coincidental with the delivery of the equipment to the job site. Manuals shall be complete, detailed guides for the maintenance and operation of equipment and roof system. They shall include complete information necessary for starting, adjusting, maintaining in continuous operation for long periods of time and dismantling and reassembling of the complete units and sub-assembly components. Manuals shall include an index covering all component parts clearly cross-referenced to diagrams and illustrations. Illustrations shall include "exploded" views showing and identifying each separate item. Emphasis shall be placed on the use of special tools and instruments. The function of each piece of equipment, component,

accessory and control shall be clearly and thoroughly explained. All necessary precautions for the operation of the equipment and the reason for each precaution shall be clearly set forth. Manuals must reference the exact model, style and size of the piece of equipment and system being furnished. Manuals referencing equipment similar to but of a different model, style, and size than that furnished will not be accepted.

- C. Instructions: Contractor shall provide qualified, factory-trained manufacturers' representatives to give detailed training to assigned Department of Veterans Affairs personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system, shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the COR and shall be considered concluded only when the COR is satisfied in regard to complete and thorough coverage. The contractor shall submit a course outline with associated material to the COR for review and approval prior to scheduling training to ensure the subject matter covers the expectations of the VA and the contractual requirements. The Department of Veterans Affairs reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the COR, does not demonstrate sufficient qualifications in accordance with requirements for instructors above.

1.26 RELOCATED EQUIPMENT AND ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in the same location, all existing equipment and items indicated by symbol "ETR" that obstruct or prevent execution of the Work or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the COR.

- C. Suitably cap existing service lines, such as steam, condensate return, water, drain, gas, air, vacuum and/or electrical, at the main whenever such lines are disconnected from equipment to be relocated. Remove abandoned lines in finished areas and cap as specified herein before under paragraph "Abandoned Lines".
- D. Provide all mechanical and electrical service connections, fittings, fastenings and any other materials necessary for assembly and installation of relocated equipment; and leave such equipment in proper operating condition.
- E. Contractor shall employ services of an installation engineer, who is an authorized representative of the manufacturer of this equipment to supervise assembly and installation of existing equipment, required to be relocated.
- F. All service lines such as noted above for relocated equipment shall be in place at point of relocation ready for use before any existing equipment is disconnected. Make relocated existing equipment ready for operation or use immediately after reinstallation.

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SECTION 01 32 16.15
PROJECT SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

- A. The Contractor shall develop a Critical Path Method (CPM) plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule), and shall keep the Project Schedule up-to-date in accordance with the requirements of this section and shall utilize the plan for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers). Conventional Critical Path Method (CPM) technique shall be utilized to satisfy both time and cost applications.

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (COR).
- B. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the requirements of this specification section.
- C. The Contractor's representative shall have the option of developing the project schedule within their organization or to engage the services of an outside consultant. If an outside scheduling consultant is utilized, Section 1.3 of this specification will apply.

1.3 CONTRACTOR'S CONSULTANT:

- A. The Contractor shall submit a qualification proposal to the COR, within 10 days of bid acceptance. The qualification proposal shall include:
1. The name and address of the proposed consultant.
 2. Information to show that the proposed consultant has the qualifications to meet the requirements specified in the preceding paragraph.
 3. A representative sample of prior construction projects, which the proposed consultant has performed complete project scheduling services. These representative samples shall be of similar size and scope.
- B. The Contracting Officer Representative (COR) has the right to approve or disapprove the proposed consultant, and will notify the Contractor

of the VA decision within seven calendar days from receipt of the qualification proposal. In case of disapproval, the Contractor shall resubmit another consultant within 10 calendar days for renewed consideration. The Contractor shall have their scheduling consultant approved prior to submitting any schedule for approval.

1.4 COMPUTER PRODUCED SCHEDULES

- A. The contractor shall provide monthly, to the Department of Veterans Affairs (VA), all computer-produced time/cost schedules and reports generated from monthly project updates. This monthly computer service will include: three copies of up to five different reports (inclusive of all pages) available within the user defined reports of the scheduling software approved by the Contracting Officer Representative (COR); a hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data; and the resulting monthly updated schedule in PDM format. These must be submitted with and substantively support the contractor's monthly payment request and the signed look ahead report. The COR shall identify the five different report formats that the contractor shall provide.
- B. The contractor shall be responsible for the correctness and timeliness of the computer-produced reports. The Contractor shall also responsible for the accurate and timely submittal of the updated project schedule and all CPM data necessary to produce the computer reports and payment request that is specified.
- C. The VA will report errors in computer-produced reports to the Contractor's representative within ten calendar days from receipt of reports. The Contractor shall reprocess the computer-produced reports and associated diskette(s), when requested by the Contracting Officer's Representative, to correct errors which affect the payment and schedule for the project.

1.5 THE COMPLETE PROJECT SCHEDULE SUBMITTAL

- A. Within 30 calendar days after receipt of Notice to Proceed, the Contractor shall submit for the Contracting Officer's review; three blue line copies of the interim schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file in the previously approved CPM schedule program. The submittal shall also include three copies of a computer-produced activity/event ID schedule showing project

duration; phase completion dates; and other data, including event cost. Each activity/event on the computer-produced schedule shall contain as a minimum, but not limited to, activity/event ID, activity/event description, duration, budget amount, early start date, early finish date, late start date, late finish date and total float. Work activity/event relationships shall be restricted to finish-to-start or start-to-start without lead or lag constraints. Activity/event date constraints, not required by the contract, will not be accepted unless submitted to and approved by the Contracting Officer Representative (COR). The contractor shall make a separate written detailed request to the Contracting Officer Representative (COR) identifying these date constraints and secure the Contracting Officer Representative's written approval before incorporating them into the network diagram. The Contracting Officer Representative's separate approval of the Project Schedule shall not excuse the contractor of this requirement. Logic events (non-work) will be permitted where necessary to reflect proper logic among work events, but must have zero duration. The complete working schedule shall reflect the Contractor's approach to scheduling the complete project. **The final Project Schedule in its original form shall contain no contract changes or delays which may have been incurred during the final network diagram development period and shall reflect the entire contract duration as defined in the bid documents.** These changes/delays shall be entered at the first update after the final Project Schedule has been approved. The Contractor should provide their requests for time and supporting time extension analysis for contract time as a result of contract changes/delays, after this update, and in accordance with Article, ADJUSTMENT OF CONTRACT COMPLETION.

- D. Within 21 calendar days after receipt of the complete project interim Project Schedule and the complete final Project Schedule, the Contracting Officer or his representative, will do one or both of the following:
1. Notify the Contractor concerning his actions, opinions, and objections.
 2. A meeting with the Contractor at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 10 calendar days after the joint

review, the Contractor shall revise and shall submit three blue line copies of the revised Project Schedule, three copies of the revised computer-produced activity/event ID schedule and a revised electronic file as specified by the Contracting Officer. The revised submission will be reviewed by the Contracting Officer and, if found to be as previously agreed upon, will be approved.

- E. The approved baseline schedule and the computer-produced schedule(s) generated there from shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

1.6 WORK ACTIVITY/EVENT COST DATA

- A. The Contractor shall cost load all work activities/events except procurement activities. The cumulative amount of all cost loaded work activities/events (including alternates) shall equal the total contract price. Prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cash flow curves indicating graphically the total percentage of work activity/event dollar value scheduled to be in place on early finish, late finish. These cash flow curves will be used by the Contracting Officer Representative to assist him in determining approval or disapproval of the cost loading. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.
- B. The Contractor shall cost load work activities/events for guarantee period services, test, balance and adjust various systems in accordance with the provisions in Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
1. Show activities/events as:
 - a. Contractor's time required for submittal of shop drawings, templates, fabrication, delivery and similar pre-construction work.
 - b. Contracting Officer Representative's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
 - c. Interruption of VA Facilities utilities, rough-in drawings, project phasing and any other specification requirements.
 - d. Maintenance and operation manuals, instructions and preventive maintenance tasks.
 - e. VA inspection and acceptance activity/event with a minimum duration of five work days at the end of each phase and immediately preceding any VA move activity/event required by the contract phasing for that phase.
 2. Show not only the activities/events for actual construction work for each trade category of the project, but also trade relationships to indicate the movement of trades from one roof area or building, to another roof area or building, for all trades who are performing major work under this contract.
 3. Break up the work into activities/events of a duration no longer than 20 work days each or one reporting period, except as to non-construction activities/events (i.e., procurement of materials, delivery of equipment, roof membrane curing) and any other activities/events for which the COR may approve the showing of a longer duration. The duration for VA approval of any required submittal, shop drawing, or other submittals will not be less than 20 work days.
 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion. Activities/events labeled "start," "continue," or "completion," are not specific and will not be allowed. Lead and lag time activities will not be acceptable.

5. The schedule shall be generally numbered in such a way to reflect discipline, phase or location of the work.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
 1. The appropriate project calendar including working days and holidays.
 2. The planned number of shifts per day.
 3. The number of hours per shift.Failure of the Contractor to include this data shall delay the review of the submittal until the Contracting Officer Representative is in receipt of the missing data.
- C. To the extent that the Project Schedule or any revised Project Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the COR. Failure to include any element of work required for the performance of this contract shall not excuse the Contractor from completing all work required within any applicable completion date of each phase regardless of the COR's approval of the Project Schedule.
- D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA an electronic file(s) containing one file of the data required to produce a schedule, reflecting all the activities/events of the complete project schedule being submitted.

1.8 PAYMENT TO THE CONTRACTOR:

- A. Monthly, the contractor shall submit an application and certificate for payment using the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Monthly payment requests shall include: a listing of all agreed upon project schedule changes and associated data; and an electronic file (s) of the resulting monthly updated schedule.

- B. Approval of the Contractor's monthly Application for Payment shall be contingent, among other factors, on the submittal of a satisfactory monthly update of the project schedule.

1.9 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the COR and the Contractor. Contractor and their CPM consultant (if applicable) shall attend all monthly schedule update meetings. The Contractor shall accurately update the Project Schedule and all other data required and provide this information to the COR three (3) work days in advance of the schedule update meeting. Job progress will be reviewed to verify:
1. Actual start and/or finish dates for updated/completed activities/events.
 2. Remaining duration for each activity/event started, or scheduled to start, but not completed.
 3. Logic, time and cost data for change orders, and supplemental agreements that are to be incorporated into the Project Schedule.
 4. Changes in activity/event sequence and/or duration which have been made, pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
 5. Completion percentage for all completed and partially completed activities/events.
 6. Logic and duration revisions required by this section of the specifications.
 7. Activity/event duration and percent complete shall be updated independently.
- B. After completion of the joint review, the contractor shall generate an updated computer-produced calendar-dated schedule and supply the Contracting Officer's representative with reports in accordance with the Article, COMPUTER PRODUCED SCHEDULES, specified.
- C. After completing the monthly schedule update, the contractor's representative or scheduling consultant shall rerun all current period contract change(s) against the prior approved monthly project schedule. The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and COR for the contract change(s). When there is a disagreement on logic and/or durations, the Contractor shall use the schedule logic and/or durations provided and approved by

the COR. After each rerun update, the resulting electronic project schedule data file shall be appropriately identified and submitted to the VA in accordance to the requirements listed in articles 1.4 and 1.7. This electronic submission is separate from the regular monthly project schedule update requirements and shall be submitted to the COR within fourteen (14) calendar days of completing the regular schedule update. **Before inserting the contract changes durations, care must be taken to ensure that only the original durations will be used for the analysis, not the reported durations after progress. In addition, once the final network diagram is approved, the contractor must recreate all manual progress payment updates on this approved network diagram and associated reruns for contract changes in each of these update periods as outlined above for regular update periods. This will require detailed record keeping for each of the manual progress payment updates.**

- D. Following approval of the CPM schedule, the VA, the General Contractor, its approved CPM Consultant, Contracting Officer Representative, and all subcontractors needed, as determined by the COR, shall meet to discuss the monthly updated schedule. The main emphasis shall be to address work activities to avoid slippage of project schedule and to identify any necessary actions required to maintain project schedule during the reporting period. The Government representatives and the Contractor should conclude the meeting with a clear understanding of those work and administrative actions necessary to maintain project schedule status during the reporting period. This schedule coordination meeting will occur after each monthly project schedule update meeting utilizing the resulting schedule reports from that schedule update. If the project is behind schedule, discussions should include ways to prevent further slippage as well as ways to improve the project schedule status, when appropriate.

1.10 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly progress schedule that phasing or contract completion dates will not be met, the Contractor shall execute some or all of the following remedial actions:
1. Increase construction manpower in such quantities and crafts as necessary to eliminate the backlog of work.

2. Increase the number of working hours per shift, shifts per working day, working days per week, the amount of construction equipment, or any combination of the foregoing to eliminate the backlog of work.
3. Reschedule the work in conformance with the specification requirements.

B. Prior to proceeding with any of the above actions, the Contractor shall notify and obtain approval from the COR for the proposed schedule changes. If such actions are approved, the representative schedule revisions shall be incorporated by the Contractor into the Project Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO THE SCHEDULE

A. Within 21 calendar days after VA acceptance and approval of any updated project schedule, the Contractor shall submit a revised electronic file (s) and a list of any activity/event changes including predecessors and successors for any of the following reasons:

1. Delay in completion of any activity/event or group of activities/events, which may be involved with contract changes, strikes, unusual weather, and other delays will not relieve the Contractor from the requirements specified unless the conditions are shown on the CPM as the direct cause for delaying the project beyond the acceptable limits.
2. Delays in submittals, or deliveries, or work stoppage are encountered which make rescheduling of the work necessary.
3. The schedule does not represent the actual prosecution and progress of the project.
4. When there is, or has been, a substantial revision to the activity/event costs regardless of the cause for these revisions.

B. CPM revisions made under this paragraph which affect the previously approved computer-produced schedules for Government furnished equipment, vacating of areas by the VA Facility, contract phase(s) and sub phase(s), utilities furnished by the Government to the Contractor, or any other previously contracted item, shall be furnished in writing to the Contracting Officer for approval.

C. Contracting Officer Representative's approval for the revised project schedule and all relevant data is contingent upon compliance with all

other paragraphs of this section and any other previous agreements by the Contracting Officer Representative.

- D. The cost of revisions to the project schedule resulting from contract changes will be included in the proposal for changes in work as specified in FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the COR may deem necessary for determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof based on revised activity/event logic, durations (in work days) and costs is obligatory to any approvals. The schedule must clearly display that the Contractor has used, in full, all the float time available for the work involved in this request. The Contracting Officer Representative's determination as to the total number of days of contract extension will be based upon the current computer-produced calendar-dated schedule for the time period in question and all other relevant information.
- B. Actual delays in activities/events which, according to the computer- produced calendar-dated schedule, do not affect the extended and predicted contract completion dates shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer Representative will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the Contractor in writing of the Contracting Officer Representative's decision.
- C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under FAR 52.243 - 4 (Changes) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of

each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.

- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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SECTION 01 33 23
SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

- 1-1. Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR 52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1-2. For the purposes of this contract, samples, test reports, certificates, and manufacturers' literature and data shall also be subject to the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1-3. Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer Representative, that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1-4. Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time the submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion.
- 1-5. Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Contracting Officer Representative on behalf of the Contracting Officer.
- 1-6. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1-7. The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals beyond those required by the contract are furnished pursuant

to request therefor by Contracting Officer Representative, adjustment in contract price and time will be made in accordance with Articles titled CHANGES (FAR 52.243-4) and CHANGES - SUPPLEMENT (VAAR 852.236-88) of the GENERAL CONDITIONS.

- 1-8. Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer Representative and Architect- Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1-9. Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer Representative assumes no responsibility for checking quantities or exact numbers included in such submittals.
 - A. Submit samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
 - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
 1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.

- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- E. Approved samples will be kept on file by the COR at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
- F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 2. Reproducible shall be full size.
 3. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's number, reference to contract drawing number, detail Section Number, and Specification Section Number.
 4. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 5. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 6. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 7. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1-10. Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to

Guidon Design, Inc.

905 North Capitol Avenue, Suite 100

Louis A. Johnson VAMC
Replace Roof Main Building & Clinical Addition
Clarksburg, WV 26301

April 7, 2016
100% Bid Documents
Project No. 540-13-308
03-01-12

Indianapolis, IN 46204

1-11. At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Contracting Officer Representative.

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SECTION 01 35 26
SAFETY REQUIREMENTS

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Replace Roof Main Building & Clinical Addition
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**SECTION 01 35 26
SAFETY REQUIREMENTS**

1.1 APPLICABLE PUBLICATIONS:

A. Latest publications listed below form part of this Article to extent referenced. Publications are referenced in text by basic designations only.

B. American Society of Safety Engineers (ASSE):

A10.1-2011.....Pre-Project & Pre-Task Safety and Health
Planning

A10.34-2012.....Protection of the Public on or Adjacent to
Construction Sites

A10.38-2013.....Basic Elements of an Employer's Program to
Provide a Safe and Healthful Work Environment
American National Standard Construction and
Demolition Operations

C. American Society for Testing and Materials (ASTM):

E84-2013.....Surface Burning Characteristics of Building
Materials

D. The Facilities Guidelines Institute (FGI):

FGI Guidelines-2010Guidelines for Design and Construction of
Healthcare Facilities

E. National Fire Protection Association (NFPA):

10-2013.....Standard for Portable Fire Extinguishers

30-2012.....Flammable and Combustible Liquids Code

51B-2014.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

70-2014.....National Electrical Code

70B-2013.....Recommended Practice for Electrical Equipment
Maintenance

70E-2012Standard for Electrical Safety in the Workplace

99-2012.....Health Care Facilities Code

241-2013.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

F. The Joint Commission (TJC)

TJC ManualComprehensive Accreditation and Certification
Manual

G. U.S. Occupational Safety and Health Administration (OSHA):

29 CFR 1904Reporting and Recording Injuries & Illnesses

29 CFR 1910Safety and Health Regulations for General
Industry

29 CFR 1926Safety and Health Regulations for Construction
Industry

CPL 2-0.124.....Multi-Employer Citation Policy

H. VHA Directive 2005-007

1.2 DEFINITIONS:

A. OSHA "Competent Person" (CP). One who is capable of identifying existing and predictable hazards in the surroundings and working conditions which are unsanitary, hazardous or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

B. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.

- C. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- D. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.
- E. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
 - 1. Death, regardless of the time between the injury and death, or the length of the illness;
 - 2. Days away from work (any time lost after day of injury/illness onset);
 - 3. Restricted work;
 - 4. Transfer to another job;
 - 5. Medical treatment beyond first aid;
 - 6. Loss of consciousness; OR
 - 7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations Of the State of West Virginia. Submit matters of interpretation of standards for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements govern except with specific approval and acceptance by the Contracting Officer Representative.

1.4 ACCIDENT PREVENTION PLAN (APP):

A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.

B. The APP shall be prepared as follows:

1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
2. Address both the Prime Contractors and the subcontractors work operations.
3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
4. Address all the elements/sub-elements and in order as follows:
 - a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:
 - 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
 - 2) Plan approver (company/corporate officers authorized to obligate the company);

3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).

b. **BACKGROUND INFORMATION.** List the following:

- 1) Contractor;
- 2) Contract number;
- 3) Project name;
- 4) Brief project description, description of work to be performed, and location; phases of work anticipated (these will require an AHA).

c. **STATEMENT OF SAFETY AND HEALTH POLICY.** Provide a copy of current corporate/company Safety and Health Policy Statement, detailing commitment to providing a safe and healthful workplace for all employees. The Contractor's written safety program goals, objectives, and accident experience goals for this contract should be provided.

d. **RESPONSIBILITIES AND LINES OF AUTHORITIES.** Provide the following:

- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;
- 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
- 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.
- 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;

- 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
 - 6) Lines of authority;
 - 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;
- e. SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:
- 1) Identification of subcontractors and suppliers (if known);
 - 2) Safety responsibilities of subcontractors and suppliers.
- f. TRAINING.**
- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
 - 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.
 - 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
 - 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)
- g. SAFETY AND HEALTH INSPECTIONS.**
- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health

CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.

- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)
- 3) The contractor will need to conduct a Preconstruction Inspection with the Infection Control Officer to identify any potential hazard zones and determine the extent of hazards to contractor employees and/or VA patients and employees. This is a prerequisite of the infection control permit classification.

Example areas of Concern:

- Vent stacks to receive work
- Exhaust ducts/units to receive work
- Abandoned equipment to be removed

h. ACCIDENT INVESTIGATION & REPORTING. The Contractor shall conduct mishap investigations of all OSHA Recordable Incidents. The APP shall include accident/incident investigation procedure & identify person(s) responsible to provide the following to the Contracting Officer Representative:

- 1) Exposure data (man-hours worked);
- 2) Accident investigations, reports, and logs.

i. PLANS (PROGRAMS, PROCEDURES) REQUIRED. Based on a risk assessment of contracted activities and on mandatory OSHA compliance programs, the Contractor shall address all applicable occupational risks in site-specific compliance and accident prevention plans. These Plans shall include but are not be limited to procedures for addressing the risks associates with the following:

- 1) Emergency response;
- 2) Contingency for severe weather;

- 3) Fire Prevention;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);
- 8) Night operations and lighting;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control program;
- 23) Heat/Cold Stress Monitoring;
- 25) Demolition plan (to include engineering survey);

C. Submit the APP to the Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP.

- D. Once accepted by the Contracting Officer Representative, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer Representative, until the matter has been rectified.
- E. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the project overall designated OSHA Competent Person, and Contracting Officer Representative. Should any severe hazard exposure, (i.e. imminent danger) become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer Representative within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS):

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.
- C. Work shall not begin until the AHA for the work activity has been accepted by the Contracting Officer Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
 - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of work involved in the AHA and familiar with current site safety issues.
 - b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by

the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Contracting Officer Representative.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals.
- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

1.7 "SITE SAFETY AND HEALTH OFFICER" (SSHO) AND "COMPETENT PERSON" (CP):

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.

- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, and Scaffolds).
- C. These Competent Persons can have collateral duties as the subcontractor's superintendent and/or work crew lead persons as well as fill more than one specialized CP role (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, and Scaffolds).
- D. The SSHO or an equally-qualified Designated Representative/alternate will maintain a presence on the site during construction operations in accordance with FAR Clause 52.236-6: *Superintendence by the Contractor*. CPs will maintain presence during their construction activities in accordance with above mentioned clause. A listing of the designated SSHO and all known CPs shall be submitted prior to the start of work as part of the APP with the training documentation and/or AHA as listed in Section 1.8 below.
- E. The repeated presence of uncontrolled hazards during a contractor's work operations will result in the designated CP as being deemed incompetent and result in the required removal of the employee in accordance with FAR Clause 52.236-5: Material and Workmanship, Paragraph (c).

1.8 TRAINING:

- A. The designated Prime Contractor SSHO must meet the requirements of all applicable OSHA standards and be capable (through training, experience, and qualifications) of ensuring that the requirements of 29 CFR 1926.16 and other appropriate Federal, State and local requirements are met for the project. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety class and have five (5) years of construction industry safety experience or three (3) years if he/she possesses a Certified Safety Professional (CSP) or certified Construction Safety and Health Technician (CSHT) certification or have a safety and health degree from an accredited university or college.

- B. All designated CPs shall have completed the OSHA 30-hour Construction Safety course within the past 5 years.
- C. In addition to the OSHA 30 Hour Construction Safety Course, all CPs with high hazard work operations such as operations involving asbestos, electrical, cranes, demolition, work at heights/fall protection, fire safety/life safety, ladder, rigging, and scaffolds shall have a specialized formal course in the hazard recognition & control associated with those high hazard work operations. Documented "repeat" deficiencies in the execution of safety requirements will require retaking the requisite formal course.
- D. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course and any necessary safety training to be able to identify hazards within their work environment.
- E. Submit training records associated with the above training requirements to the Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES 15 calendar days prior to the date of the preconstruction conference for acceptance.
- F. Prior to any worker for the contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the SSHO or his/her designated representative. As a minimum, this briefing shall include information on the site-specific hazards, construction limits, VAMC safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VAMC equipment, emergency procedures, accident reporting etc... Documentation shall be provided to the Contracting Officer Representative that individuals have undergone contractor's safety briefing.
- G. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as

required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.

- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 2. The Contracting Officer Representative will be notified immediately prior to start of the inspection and invited to accompany the inspection.
 3. Identified hazard and controls will be discussed to come to a mutual understanding to ensure abatement and prevent future reoccurrence.
 4. A report of the inspection findings with status of abatement will be provided to the Contracting Officer Representative within one week of the onsite inspection.

1.10 ACCIDENTS, OSHA 300 LOGS, AND MAN-HOURS:

- A. Notify the Contracting Officer Representative as soon as practical, but no more than four hours after any accident meeting the definition of OSHA Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$5,000, or any weight handling equipment accident. Within notification include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions

and evidence on the accident site until the Contracting Officer Representative determine whether a government investigation will be conducted.

- B. Conduct an accident investigation for recordable injuries and illnesses, for Medical Treatment defined in paragraph DEFINITIONS, and property damage accidents resulting in at least \$20,000 in damages, to establish the root cause(s) of the accident. Complete the VA Form 2162, and provide the report to the Contracting Officer Representative within 5 calendar days of the accident. The Contracting Officer Representative will provide copies of any required or special forms.
- C. A summation of all man-hours worked by the contractor and associated sub-contractors for each month will be reported to the Contracting Officer Representative monthly.
- D. A summation of all OSHA recordable accidents experienced on site by the contractor and associated sub-contractors for each month will be provided to the Contracting Officer Representative monthly. The contractor and associated sub-contractors' OSHA 300 logs will be made available to the Contracting Officer Representative as requested.

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.
- B. Mandatory PPE includes:
 - 1. Hard Hats - unless written authorization is given by the Contracting Officer Representative in circumstances of work operations that have limited potential for falling object hazards such as during finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.

2. Safety glasses - unless written authorization is given by the Contracting Officer Representative appropriate safety glasses meeting the ANSI Z.87.1 standard must be worn by each person on site.
3. Appropriate Safety Shoes - based on the hazards present, safety shoes meeting the requirements of ASTM F2413-11 shall be worn by each person on site unless written authorization is given by the Contracting Officer Representative.
4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the Contracting Officer Representative before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the Contracting Officer Representative. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project is: **Class 1**, however, work outside the primary project scope area may vary. The required infection control precautions with each class are as follows:

1. Class I requirements:

a. During Construction Work:

- 1) Notify the Contracting Officer Representative.
- 2) Execute work by methods to minimize raising dust from construction operations.
- 3) Ceiling tiles: Immediately replace a ceiling tiles displaced for visual inspection.

b. Upon Completion:

- 1) Clean work area upon completion of task
- 2) Notify the Contracting Officer Representative.

2. Class II requirements:

a. During Construction Work:

- 1) Notify the Contracting Officer Representative.
- 2) Provide active means to prevent airborne dust from dispersing into atmosphere such as wet methods or tool-mounted dust collectors where possible.
- 3) Water mist work surfaces to control dust while cutting.
- 4) Seal unused doors with duct tape.
- 5) Block off and seal air vents.
- 6) Remove or isolate HVAC system in areas where work is being performed.

b. Upon Completion:

- 1) Wipe work surfaces with cleaner/disinfectant.
- 2) Contain construction waste before transport in tightly covered containers.

- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
- 4) Upon completion, restore HVAC system where work was performed
- 5) Notify the Contracting Officer Representative.

3. Class III requirements:

a. During Construction Work:

- 1) Obtain permit from the Contracting Officer Representative.
- 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
- 5) Contain construction waste before transport in tightly covered containers.
- 6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Contracting Officer Representative and thoroughly cleaned by the VA Environmental Services Department.

- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Vacuum work area with HEPA filtered vacuums.
- 4) Wet mop area with cleaner/disinfectant.
- 5) Upon completion, restore HVAC system where work was performed.
- 6) Return permit to the Contracting Officer Representative.

4. Class IV requirements:

a. During Construction Work:

- 1) Obtain permit from the Contracting Officer Representative.
- 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non-work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.
- 4) Maintain negative air pressure within work site utilizing HEPA equipped air filtration units.
- 5) Seal holes, pipes, conduits, and punctures.
- 6) Construct anteroom and require all personnel to pass through this room so they can be vacuumed using a HEPA vacuum cleaner before leaving work site or they can wear cloth or paper coveralls that are removed each time they leave work site.
- 7) All personnel entering work site are required to wear shoe covers. Shoe covers must be changed each time the worker exits the work area.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Contracting Officer Representative with thorough cleaning by the VA Environmental Services Dept.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Contain construction waste before transport in tightly covered containers.
- 4) Cover transport receptacles or carts. Tape the covering unless solid lid.
- 5) Vacuum work area with HEPA filtered vacuums.
- 6) Wet mop area with cleaner/disinfectant.
- 7) Upon completion, restore HVAC system where work was performed.
- 8) Return permit to the Contracting Officer Representative.

C. Barriers shall be erected as required based upon classification (Class III & IV requires barriers) and shall be constructed as follows:

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Contracting Officer Representative and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping

- b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
 - f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.
- D. Products and Materials:
- 1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
 - 2. Barrier Doors: Self Closing One-hour fire-rated solid core wood in steel frame, painted
 - 3. Dust proof one-hour fire-rated drywall
 - 4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
 - 5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
 - 6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
 - 7. Disinfectant: Hospital-approved disinfectant or equivalent product

8. Portable Ceiling Access Module

- E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- F. A dust control program will be establish and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.
- H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.
 - 1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
 - 2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
 - 3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.

4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the Contracting Officer Representative and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down.
6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary
3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been found have negative TB screening reactions. Contractors shall be required to show documentation of negative TB screening reactions for any additional workers who are added after the 90-day requirement before they will be allowed to work on the work site. NOTE: This can be the Center for Disease Control (CDC) and Prevention and two-step skin testing or a Food and Drug Administration (FDA)-approved blood test.
 1. Contract employees manifesting positive screening reactions to the tuberculin shall be examined according to current CDC guidelines prior to working on VHA property.
 2. Subsequently, if the employee is found without evidence of active (infectious) pulmonary TB, a statement documenting examination by a physician shall be on file with the employer (construction contractor), noting that the employee with a positive tuberculin screening test is without evidence of active (infectious) pulmonary TB.
 3. If the employee is found with evidence of active (infectious) pulmonary TB, the employee shall require treatment with a subsequent

statement to the fact on file with the employer before being allowed to return to work on VHA property.

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures, including periodic status reports, and submit to Contracting Officer Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.
- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer Representative.
- E. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer Representative.
- F. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- G. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- H. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection, and fire alarm systems, except for portions immediately under construction, and temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. Request

interruptions in accordance with Article, OPERATIONS AND STORAGE AREAS, and coordinate with Contracting Officer Representative. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the medical center. Parameters for the testing and results of any tests performed shall be recorded by the medical center and copies provided to the Contracting Officer Representative.

- I. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer Representative.

- J. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer Representative at least 48 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

- K. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer Representative.

- L. Smoking: Smoking is prohibited in and adjacent to construction areas inside existing buildings and additions under construction. In separate and detached buildings under construction, smoking is prohibited except in designated smoking rest areas.

- M. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.

- N. If required, submit documentation to the Contracting Officer Representative that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J - General Environmental Controls, 29

CFR Part 1910 Subpart S - Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.

- B. All qualified persons performing electrical work under this contract shall be licensed journeyman or master electricians. All apprentice electricians performing under this contract shall be deemed unqualified persons unless they are working under the immediate supervision of a licensed electrician or master electrician.
- C. All electrical work will be accomplished de-energized and in the Electrically Safe Work Condition (refer to NFPA 70E for Work Involving Electrical Hazards, including Exemptions to Work Permit). Any Contractor, subcontractor or temporary worker who fails to fully comply with this requirement is subject to immediate termination in accordance with FAR clause 52.236-5(c). Only in rare circumstance where achieving an electrically safe work condition prior to beginning work would increase or cause additional hazards, or is infeasible due to equipment design or operational limitations is energized work permitted. The Contracting Officer Representative with approval of the Medical Center Director will make the determination if the circumstances would meet the exception outlined above. An AHA specific to energized work activities will be developed, reviewed, and accepted prior to the start of that work.
1. Development of a Hazardous Electrical Energy Control Procedure is required prior to de-energization. A single Simple Lockout/Tagout Procedure for multiple work operations can only be used for work involving qualified person(s) de-energizing one set of conductors or circuit part source. Task specific Complex Lockout/Tagout Procedures are required at all other times.
 2. Verification of the absence of voltage after de-energization and lockout/tagout is considered "energized electrical work" (live work) under NFPA 70E, and shall only be performed by qualified persons wearing appropriate shock protective (voltage rated) gloves and arc rate personal protective clothing and equipment, using Underwriters Laboratories (UL) tested and appropriately rated contact electrical

- testing instruments or equipment appropriate for the environment in which they will be used.
3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the The Contracting Officer Representative.
- D.** Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity has been accepted by the Contracting Officer Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
- E.** Ground-fault circuit interrupters. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites shall have approved ground-fault circuit interrupters for personnel protection. "Assured Equipment Grounding Conductor Program" only is not allowed.

1.16 FALL PROTECTION

- A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.
1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.
 2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.
 3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does

not require FP. No worker shall be allowed in the area between the roof or floor edge and the WLS without FP. FP is required when working outside the WLS.

4. Fall protection while using a ladder will be governed by the OSHA requirements.

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

- A. All scaffolds and other work platforms construction activities shall comply with 29 CFR 1926 Subpart L.
- B. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) as stated in Section 1.16.
- C. The following hierarchy and prohibitions shall be followed in selecting appropriate work platforms.
 1. Scaffolds, platforms, or temporary floors shall be provided for all work except that can be performed safely from the ground or similar footing.
 2. Ladders less than 20 feet may be used as work platforms only when use of small hand tools or handling of light material is involved.
 3. Ladder jacks, lean-to, and prop-scaffolds are prohibited.
 4. Emergency descent devices shall not be used as working platforms.
- D. Contractors shall use a scaffold tagging system in which all scaffolds are tagged by the Competent Person. Tags shall be color-coded: green indicates the scaffold has been inspected and is safe to use; red indicates the scaffold is unsafe to use. Tags shall be readily visible, made of materials that will withstand the environment in which they are used, be legible and shall include:
 1. The Competent Person's name and signature;
 2. Dates of initial and last inspections.
- E. Mast Climbing work platforms: When access ladders, including masts designed as ladders, exceed 20 ft (6 m) in height, positive fall protection shall be used.

1.19 CRANES

- A. All crane work shall comply with 29 CFR 1926 Subpart CC.
- B. Prior to operating a crane, the operator must be licensed, qualified or certified to operate the crane. Thus, all the provisions contained with Subpart CC are effective and there is no "Phase In" date of November 10, 2014.
- C. A detailed lift permit shall be submitted 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing. The lift will not be allowed without approval of this document.
- D. Crane operators shall not carry loads
 - 1. over the general public or VAMC personnel
 - 2. over any occupied building unless
 - a. the top two floors are vacated
 - b. or overhead protection with a design live load of 300 psf is provided

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

- A. All installation, maintenance, and servicing of equipment or machinery shall comply with 29 CFR 1910.147 except for specifically referenced operations in 29 CFR 1926 such as concrete & masonry equipment [1926.702(j)], heavy machinery & equipment [1926.600(a)(3)(i)], and process safety management of highly hazardous chemicals (1926.64). Control of hazardous electrical energy during the installation, maintenance, or servicing of electrical equipment shall comply with Section 1.15 to include NFPA 70E and other VA specific requirements discussed in the section.

1.21 CONFINED SPACE ENTRY

- A. All confined space entry shall comply with 29 CFR 1910.146 except for specifically referenced operations in 29 CFR 1926 such as excavations/trenches [1926.651(g)].

- B. A site-specific Confined Space Entry Plan (including permitting process) shall be developed and submitted to the Contracting Officer Representative.

1.22 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer Representative. Obtain permits from Contracting Officer Representative at least 48 hours in advance. Designate contractor's responsible project-site fire prevention program manager to permit hot work.

- #### **1.23 LADDERS**
- A. All Ladder use shall comply with 29 CFR 1926 Subpart X.
 - B. All portable ladders shall be of sufficient length and shall be placed so that workers will not stretch or assume a hazardous position.
 - C. Manufacturer safety labels shall be in place on ladders
 - D. Step Ladders shall not be used in the closed position
 - E. Top steps or cap of step ladders shall not be used as a step
 - F. Portable ladders, used as temporary access, shall extend at least 3 ft (0.9 m) above the upper landing surface.
 - 1. When a 3 ft (0.9-m) extension is not possible, a grasping device (such as a grab rail) shall be provided to assist workers in mounting and dismounting the ladder.
 - 2. In no case shall the length of the ladder be such that ladder deflection under a load would, by itself, cause the ladder to slip from its support.
 - G. Ladders shall be inspected for visible defects on a daily basis and after any occurrence that could affect their safe use. Broken or damaged ladders shall be immediately tagged "DO NOT USE," or with similar wording, and withdrawn from service until restored to a condition meeting their original design.

1.24 FLOOR & WALL OPENINGS

- A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M.
- B. Floor and roof holes/openings are any that measure over 2 in (51 mm) in any direction of a walking/working surface which persons may trip or fall into or where objects may fall to the level below. See 21.F for covering and labeling requirements. Skylights located in floors or roofs are considered floor or roof hole/openings.
- C. All floor, roof openings or hole into which a person can accidentally walk or fall through shall be guarded either by a railing system with toeboards along all exposed sides or a load-bearing cover. When the cover is not in place, the opening or hole shall be protected by a removable guardrail system or shall be attended when the guarding system has been removed, or other fall protection system.
 - 1. Covers shall be capable of supporting, without failure, at least twice the weight of the worker, equipment and material combined.
 - 2. Covers shall be secured when installed, clearly marked with the word "HOLE", "COVER" or "Danger, Roof Opening-Do Not Remove" or color-coded or equivalent methods (e.g., red or orange "X"). Workers must be made aware of the meaning for color coding and equivalent methods.
 - 3. Roofing material, such as roofing membrane, insulation or felts, covering or partly covering openings or holes, shall be immediately cut out. No hole or opening shall be left unattended unless covered.
 - 4. Non-load-bearing skylights shall be guarded by a load-bearing skylight screen, cover, or railing system along all exposed sides.
 - 5. Workers are prohibited from standing/walking on skylights.

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**SECTION 01 42 19
REFERENCE STANDARDS**

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies the availability and source of references and standards specified in the project manual under paragraphs APPLICABLE PUBLICATIONS and/or shown on the drawings.

1.2 AVAILABILITY OF SPECIFICATIONS LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS FPMR PART 101-29 (FAR 52.211-1) (AUG 1998)

- A. The GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, FPMR Part 101-29 and copies of specifications, standards, and commercial item descriptions cited in the solicitation may be obtained for a fee by submitting a request to - GSA Federal Supply Service, Specifications Section, Suite 8100, 470 East L'Enfant Plaza, SW, Washington, DC 20407, Telephone (202) 619-8925, Facsimile (202) 619-8978.
- B. If the General Services Administration, Department of Agriculture, or Department of Veterans Affairs issued this solicitation, a single copy of specifications, standards, and commercial item descriptions cited in this solicitation may be obtained free of charge by submitting a request to the addressee in paragraph (a) of this provision. Additional copies will be issued for a fee.

1.3 AVAILABILITY FOR EXAMINATION OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-4) (JUN 1988)

The specifications and standards cited in this solicitation can be examined at the following location:

DEPARTMENT OF VETERANS AFFAIRS
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

1.4 AVAILABILITY OF SPECIFICATIONS NOT LISTED IN THE GSA INDEX OF FEDERAL SPECIFICATIONS, STANDARDS AND COMMERCIAL ITEM DESCRIPTIONS (FAR 52.211-3) (JUN 1988)

The specifications cited in this solicitation may be obtained from the associations or organizations listed below.

- AA Aluminum Association Inc.
<http://www.aluminum.org>
- ACGIH American Conference of Governmental Industrial Hygienists
<http://www.acgih.org>
- ACI American Concrete Institute
<http://www.aci-int.net>
- AGC Associated General Contractors of America
<http://www.agc.org>
- AIA American Institute of Architects
<http://www.aia.org>
- AISC American Institute of Steel Construction
<http://www.aisc.org>
- AISI American Iron and Steel Institute
<http://www.steel.org>
- ANSI American National Standards Institute, Inc.
<http://www.ansi.org>
- ASME American Society of Mechanical Engineers
<http://www.asme.org>
- ASSE American Society of Sanitary Engineering
<http://www.asse-plumbing.org>
- ASTM American Society for Testing and Materials
<http://www.astm.org>
- AWS American Welding Society
<http://www.aws.org>

AWWA American Water Works Association
<http://www.awwa.org>

CISPI Cast Iron Soil Pipe Institute
<http://www.cispi.org>

DHI Door and Hardware Institute
<http://www.dhi.org>

EEI Edison Electric Institute
<http://www.eei.org>

EPA Environmental Protection Agency
<http://www.epa.gov>

FCC Federal Communications Commission
<http://www.fcc.gov>

FM Factory Mutual Insurance
<http://www.fmglobal.com>

GA Gypsum Association
<http://www.gypsum.org>

GSA General Services Administration
<http://www.gsa.gov>

ICBO International Conference of Building Officials
<http://www.icbo.org>

IEEE Institute of Electrical and Electronics Engineers
<http://www.ieee.org>

NAAMM National Association of Architectural Metal Manufacturers
<http://www.naamm.org>

NAPHCC Plumbing-Heating-Cooling Contractors Association
<http://www.phccweb.org.org>

NBS National Bureau of Standards
See - NIST

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
<http://www.nema.org>

NFPA National Fire Protection Association
<http://www.nfpa.org>

NIH National Institute of Health
<http://www.nih.gov>

NIST National Institute of Standards and Technology
<http://www.nist.gov>

NLMA Northeastern Lumber Manufacturers Association, Inc.
<http://www.nelma.org>

NPA National Particleboard Association
18928 Premiere Court
Gaithersburg, MD 20879
(301) 670-0604

NSF National Sanitation Foundation
<http://www.nsf.org>

OSHA Occupational Safety and Health Administration
Department of Labor
<http://www.osha.gov>

PPI The Plastic Pipe Institute
<http://www.plasticpipe.org>

RMA Rubber Manufacturers Association, Inc.
<http://www.rma.org>

SDI Steel Door Institute
<http://www.steeldoor.org>

IGMA Insulating Glass Manufacturers Alliance
<http://www.igmaonline.org>

Louis A. Johnson VAMC
Replace Roof Main Building & Clinical Addition
Clarksburg, WV 26301

April 7, 2016
100% Bid Documents
Project No. 540-13-308
07-01-15

SMACNA Sheet Metal and Air-Conditioning Contractors
National Association, Inc.
<http://www.smacna.org>

UBC The Uniform Building Code
See ICBO

UL Underwriters' Laboratories Incorporated

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SECTION 01 57 19
TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely effect human health or welfare,
 2. Unfavorably alter ecological balances of importance to human life,
 3. Effect other species of importance to humankind, or;
 4. Degrade the utility of the environment for aesthetic, cultural, and historical purposes.
- C. Definitions of Pollutants:
1. Chemical Waste: Petroleum products, bituminous materials, salts, acids, alkalis, herbicides, pesticides, organic chemicals, and inorganic wastes.
 2. Debris: Combustible and noncombustible wastes, such as waste materials resulting from construction or maintenance and repair work.
 3. Sediment: Soil and other debris that has been eroded and transported by runoff water.
 4. Solid Waste: Rubbish, debris, garbage, and other discarded solid materials resulting from industrial, commercial, and agricultural operations and from community activities.
 5. Surface Discharge: The term "Surface Discharge" implies that the water is discharged with possible sheeting action and subsequent soil erosion may occur. Waters that are surface discharged may terminate in drainage ditches, storm sewers, creeks, and/or "water of the United States" and would require a permit to discharge water from the governing agency.
 6. Rubbish: Combustible and noncombustible wastes such as paper, boxes, glass and crockery, metal and lumber scrap, tin cans, and bones.

7. Sanitary Wastes:

- a. Sewage: Domestic sanitary sewage and human and animal waste.
- b. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.

1.2 QUALITY CONTROL

- A. Establish and maintain quality control for the environmental protection of all items set forth herein.
- B. Record on daily reports any problems in complying with laws, regulations, and ordinances. Note any corrective action taken.

1.3 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. U.S. National Archives and Records Administration (NARA):
33 CFR 328.....Definitions

1.4 SUBMITTALS

- A. In accordance with Section, 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
 - 1. Environmental Protection Plan: After the contract is awarded and prior to the commencement of the work, the Contractor shall meet with the Contracting Officer Representative to discuss the proposed Environmental Protection Plan and to develop mutual understanding relative to details of environmental protection. Not more than 20 days after the meeting, the Contractor shall prepare and submit to the Contracting Officer Representative (COR) for approval, a written and/or graphic Environmental Protection Plan including, but not limited to, the following:
 - a. Name(s) of person(s) within the Contractor's organization who is (are) responsible for ensuring adherence to the Environmental Protection Plan.
 - b. Name(s) and qualifications of person(s) responsible for manifesting hazardous waste to be removed from the site.
 - c. Name(s) and qualifications of person(s) responsible for training the Contractor's environmental protection personnel.
 - d. Description of the Contractor's environmental protection personnel training program.
 - e. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control, noise control and abatement that are applicable to the Contractor's

proposed operations and the requirements imposed by those laws, regulations, and permits.

- f. Methods for protection of features to be preserved within authorized work areas including trees, shrubs, vines, grasses, ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, and archeological and cultural resources.
 - g. Procedures to provide the environmental protection that comply with the applicable laws and regulations. Describe the procedures to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures as described in the Environmental Protection Plan.
 - h. Permits, licenses, and the location of the solid waste disposal area.
 - i. Drawings showing locations of any proposed temporary material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials. Include as part of an Erosion Control Plan approved by the District Office of the U.S. Soil Conservation Service and the Department of Veterans Affairs.
 - j. Environmental Monitoring Plans for the job site including land, water, air, and noise.
 - k. Work Area Plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas. This plan may be incorporated within the Erosion Control Plan.
- B. Approval of the Contractor's Environmental Protection Plan will not relieve the Contractor of responsibility for adequate and continued control of pollutants and other environmental protection measures.

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Contracting Officer Representative. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.

1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features by marking, fencing, or using any other approved techniques.
 - a. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.
 - b. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features on the Environmental Protection Plan. 9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.
11. Handle discarded materials other than those included in the solid waste category as directed by the Contracting Officer Representative.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
 1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.

2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of West Virginia and Federal emission and performance laws and standards. Maintain ambient air quality standards set by the Environmental Protection Agency, for those construction operations and activities specified.
1. Particulates: Control dust particles, aerosols, and gaseous by-products from all construction activities, processing, and preparation of materials at all times, including weekends, holidays, and hours when work is not in progress.
 2. Particulates Control: Maintain all stockpiles, haul roads, permanent and temporary access roads, and all other work areas within or outside the project boundaries free from particulates which would cause a hazard or a nuisance. Sprinklering, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators, or other methods are permitted to control particulates in the work area.
 3. Hydrocarbons and Carbon Monoxide: Control monoxide emissions from equipment to Federal and State allowable limits.
 4. Odors: Control odors of construction activities and prevent obnoxious odors from occurring.
- F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer Representative. Maintain noise-produced work at or below the decibel levels and within the time periods specified.
1. Perform construction activities involving repetitive, high-level impact noise only between 8:00 a.m. and 6:00 p.m unless otherwise permitted by local ordinance or the Contracting Officer Representative. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70

Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:

a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

MATERIALS HANDLING

CRANES 75

TRUCKS 75

PNEUMATIC TOOLS 80

GENERATORS 75

SAWS 75

COMPRESSORS 75

- b. Use shields or other physical barriers to restrict noise transmission.
 - c. Provide soundproof housings or enclosures for noise-producing machinery.
 - d. Use efficient silencers on equipment air intakes.
 - e. Use efficient intake and exhaust mufflers on internal combustion engines that are maintained so equipment performs below noise levels specified.
 - f. Line hoppers and storage bins with sound deadening material.
 - g. Conduct truck loading, unloading, and hauling operations so that noise is kept to a minimum.
3. Measure sound level for noise exposure due to the construction at least once every five successive working days while work is being performed above 55 dB(A) noise level. Measure noise exposure at the property line or 15 m (50 feet) from the noise source, whichever is greater. Measure the sound levels on the A weighing network of a

General Purpose sound level meter at slow response. To minimize the effect of reflective sound waves at buildings, take measurements at 900 to 1800 mm (three to six feet) in front of any building face.

Submit the recorded information to the Contracting Officer Representative noting any problems and the alternatives for mitigating actions.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Contracting Officer Representative. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 58 16
TEMPORARY INTERIOR SIGNAGE

PART 1 GENERAL

DESCRIPTION

This section specifies temporary interior signs.

PART 2 PRODUCTS

2.1 TEMPORARY SIGNS

- A. Fabricate from 50 Kg (110 pound) mat finish white paper.
- B. Cut to 100 mm (4-inch) wide by 300 mm (12 inch) long size tag.
- C. Punch 3 mm (1/8-inch) diameter hole centered on 100 mm (4-inch) dimension of tag. Edge of Hole spaced approximately 13 mm (1/2-inch) from one end on tag.
- D. Reinforce hole on both sides with gummed cloth washer or other suitable material capable of preventing tie pulling through paper edge.
- E. Ties: Steel wire 0.3 mm (0.0120-inch) thick, attach to tag with twist tie, leaving 150 mm (6-inch) long free ends.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install temporary signs attached to room door frame or room door knob, lever, or pull for doors on corridor openings.
- B. Mark on signs with felt tip marker having approximately 3 mm (1/8-inch) wide stroke for clearly legible numbers or letters.
- C. Identify room with numbers as designated on floor plans.

3.2 LOCATION

- A. Install on doors that have room, corridor, and space numbers shown.
- B. Doors that do not require signs are as follows:
 - 1. Corridor barrier doors (cross-corridor) in corridor with same number.
 - 2. Folding doors or partitions.
 - 3. Toilet or bathroom doors within and between rooms.
 - 4. Communicating doors in partitions between rooms with corridor entrance doors.
 - 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for the management of non-hazardous building construction and demolition waste.
- B. Waste disposal in landfills shall be minimized to the greatest extent possible. Of the inevitable waste that is generated, as much of the waste material as economically feasible shall be salvaged, recycled or reused.
- C. Contractor shall use all reasonable means to divert construction and demolition waste from landfills and incinerators, and facilitate their salvage and recycle not limited to the following:
 - 1. Waste Management Plan development and implementation.
 - 2. Techniques to minimize waste generation.
 - 3. Sorting and separating of waste materials.
 - 4. Salvage of existing materials and items for reuse or resale.
 - 5. Recycling of materials that cannot be reused or sold.
- D. At a minimum the following waste categories shall be diverted from landfills:
 - 3. Clean dimensional wood and palette wood.
 - 6. Metal products (eg, steel, wire, beverage containers, copper, etc).
 - 7. Cardboard, paper and packaging.
 - 8. Bitumen roofing materials.
 - 9. Plastics (eg, ABS, PVC).
 - 11. Gypsum board.
 - 12. Insulation.

1.2 RELATED WORK

- A. Section 02 41 00, DEMOLITION.
- B. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

- A. Contractor shall practice efficient waste management when sizing, cutting and installing building products. Processes shall be employed to ensure the generation of as little waste as possible. Construction /Demolition waste includes products of the following:
 - 1. Excess or unusable construction materials.
 - 2. Packaging used for construction products.

3. Poor planning and/or layout.
 4. Construction error.
 5. Over ordering.
 6. Weather damage.
 7. Contamination.
 8. Mishandling.
 9. Breakage.
- B. Establish and maintain the management of non-hazardous building construction and demolition waste set forth herein. Conduct a site assessment to estimate the types of materials that will be generated by demolition and construction.
- C. Contractor shall develop and implement procedures to recycle construction and demolition waste to a minimum of 50 percent.
- D. Contractor shall be responsible for implementation of any special programs involving rebates or similar incentives related to recycling. Any revenues or savings obtained from salvage or recycling shall accrue to the contractor.
- E. Contractor shall provide all demolition, removal and legal disposal of materials. Contractor shall ensure that facilities used for recycling, reuse and disposal shall be permitted for the intended use to the extent required by local, state, federal regulations. The Whole Building Design Guide website <http://www.wbdg.org/tools/cwm.php> provides a Construction Waste Management Database that contains information on companies that haul, collect, and process recyclable debris from construction projects.
- F. Contractor shall assign a specific area to facilitate separation of materials for reuse, salvage, recycling, and return. Such areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing of materials.
- G. Contractor shall provide on-site instructions and supervision of separation, handling, salvaging, recycling, reuse and return methods to be used by all parties during waste generating stages.
- H. Record on daily reports any problems in complying with laws, regulations and ordinances with corrective action taken.

1.4 TERMINOLOGY

- A. Class III Landfill: A landfill that accepts non-hazardous resources such as household, commercial and industrial waste resulting from construction, remodeling, repair and demolition operations.
- B. Clean: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics and like products.
- C. Construction and Demolition Waste: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. Dismantle: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. Disposal: Acceptance of solid wastes at a legally operating facility for the purpose of land filling (includes Class III landfills and inert fills).
- F. Inert Backfill Site: A location, other than inert fill or other disposal facility, to which inert materials are taken for the purpose of filling an excavation, shoring or other soil engineering operation.
- G. Inert Fill: A facility that can legally accept inert waste, such as asphalt and concrete exclusively for the purpose of disposal.
- H. Inert Solids/Inert Waste: Non-liquid solid resources including, but not limited to, soil and concrete that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional water board, and does not contain significant quantities of decomposable solid resources.
- I. Mixed Debris: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- J. Mixed Debris Recycling Facility: A solid resource processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- K. Permitted Waste Hauler: A company that holds a valid permit to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- L. Recycling: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.

1. On-site Recycling - Materials that are sorted and processed on site for use in an altered state in the work, i.e. concrete crushed for use as a sub-base in paving.
 2. Off-site Recycling - Materials hauled to a location and used in an altered form in the manufacture of new products.
- M. Recycling Facility: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of new products. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a solid waste facilities permit or be regulated by the local enforcement agency.
- N. Reuse: Materials that are recovered for use in the same form, on-site or off-site.
- O. Return: To give back reusable items or unused products to vendors for credit.
- P. Salvage: To remove waste materials from the site for resale or re-use by a third party.
- Q. Source-Separated Materials: Materials that are sorted by type at the site for the purpose of reuse and recycling.
- R. Solid Waste: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- S. Transfer Station: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.5 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES, furnish the following:
- B. Prepare and submit to the COR a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 1. Procedures to be used for debris management.
 2. Techniques to be used to minimize waste generation.
 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.

- b. List of each material and quantity proposed to be taken to a landfill.
- 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.
 - c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

- A Publications listed below form a part of this specification to the extent referenced. Publications are referenced by the basic designation only. In the event that criteria requirements conflict, the most stringent requirements shall be met.
- B. U.S. Green Building Council (USGBC):
LEED Green Building Rating System for New Construction

1.7 RECORDS

Maintain records to document the quantity of waste generated; the quantity of waste diverted through sale, reuse, or recycling; and the quantity of waste disposed by landfill or incineration. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. List of each material and quantity to be salvaged, recycled, reused.
- B. List of each material and quantity proposed to be taken to a landfill.
- C. Material tracking data: Receiving parties, dates removed, transportation costs, weight tickets, tipping fees, manifests, invoices, net total costs or savings.

PART 3 - EXECUTION

3.1 COLLECTION

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management.
- B. Clearly identify containers, bins and storage areas so that recyclable materials are separated from trash and can be transported to respective recycling facility for processing.
- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

- A. Contractor shall be responsible for transporting and disposing of materials that cannot be delivered to a source-separated or mixed materials recycling facility to a transfer station or disposal facility that can accept the materials in accordance with state and federal regulations.
- B. Construction or demolition materials with no practical reuse or that cannot be salvaged or recycled shall be disposed of at a landfill or incinerator.

3.3 REPORT

- A. With each application for progress payment, submit a summary of construction and demolition debris diversion and disposal including beginning and ending dates of period covered.
- B. Quantify all materials diverted from landfill disposal through salvage or recycling during the period with the receiving parties, dates removed, transportation costs, weight tickets, manifests, invoices. Include the net total costs or savings for each salvaged or recycled material.
- C. Quantify all materials disposed of during the period with the receiving parties, dates removed, transportation costs, weight tickets, tipping

Louis A. Johnson VAMC
Replace Roof Main Building & Clinical Addition
Clarksburg, WV 26301

April 7, 2016
100% Bid Documents
Project No. 540-13-308
09-01-13

fees, manifests, invoices. Include the net total costs for each
disposal.

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SECTION 01 81 11

SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

This Section describes general requirements and procedures to comply with the Guiding Principles for Leadership in High Performance and Sustainable Buildings Memorandum of Understanding incorporated in the Executive Orders 13423 and 13514; Energy Policy Act of 2005 (EPA 2005) and the Energy Independence and Security Act of 2007 (EISA 2007).

1.2 OBJECTIVES

- A. To maximize resource efficiency and reduce the environmental impacts of construction and operation, the Contractor during the construction phase of this project shall implement the following procedures:
1. Select products that minimize consumption of energy, water and non-renewable resources, while minimizing the amounts of pollution resulting from the production and employment of building technologies. It is the intent of this project to conform with EPA's Five Guiding Principles on environmentally preferable purchasing. The five principles are:
 - a. Include environmental considerations as part of the normal purchasing process.
 - b. Emphasize pollution prevention early in the purchasing process.
 - c. Examine multiple environmental attributes throughout a product's or service's life cycle.
 - d. Compare relevant environmental impacts when selecting products and services.
 - e. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
 3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes.

1.3 RELATED DOCUMENTS

- A. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT

1.4 DEFINITIONS

- A. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials
- C. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight
- E. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder
- F. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock
- J. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- K. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": www.ftc.gov/bcp/grnrule/guides980427
- L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site
- M. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured
- N. Sealant: Any material that fills and seals gaps between other materials

- O. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- P. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals offgas
- Q. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.5 SUBMITTALS

A. Sustainable Design Submittals:

- 1. Heat Island Effect:
 - a. Roofing Materials: Submittals for roofing materials must include manufacturer's cut sheets or product data highlighting the Solar Reflectance Index (SRI) of the material.
- 11. Salvaged or Reused Materials: Provide documentation that lists each salvaged or reused material, the source or vendor of the material, the purchase price, and the replacement cost if greater than the purchase price.
- 12. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
 - a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis,

line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.

13. Regional Materials: Submittals for all products or materials expected to contribute to the regional calculation (excluding MEP systems equipment and components) must include the following documentation:
 - a. Cost of each material or product, excluding cost of labor and equipment for installation
 - b. Location of product manufacture and distance from point of manufacture to the Project Site
 - c. Location of point of extraction, harvest, or recovery for each raw material in each product and distance from the point of extraction, harvest, or recovery to the Project Site
 - d. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of manufacture for each regional material
 - e. Manufacturer's product data, product literature, or a letter from the manufacturer verifying the location and distance from the Project Site to the point of extraction, harvest, or recovery for each regional material or product, including, at a minimum, gravel and fill, planting materials, concrete, masonry, and GWB
 - f. An electronic spreadsheet that tabulates the Project's total materials cost and regional materials value, expressed as a percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate on an ongoing basis, line items for each material, including cost, location of manufacture, distance from manufacturing plant to the Project Site, location of raw material extraction, and distance from extraction point to the Project Site.

17. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air

- quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
27. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
28. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
- C. Construction Waste Management: See Section 01 74 19 "Construction Waste Management" for submittal requirements.
- F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:
1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 "Construction Waste Management."
 2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

1.6 QUALITY ASSURANCE

- A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with VA - COR, Architect, and all Subcontractors to discuss the Construction Waste Management Plan and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer Representative and the Construction Quality Manager.
- B. Construction Job Conferences: The status of compliance with the Sustainable Design Requirements of these specifications will be an agenda item at all regular job meetings conducted during the course of work at the site.

PART 2 - PRODUCTS

2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS

- A. Do not burn rubbish, organic matter, etc. or any material on the site. Dispose of legally in accordance with Specifications Sections 01 74 19.

C. Roofing Materials: All roofing systems must comply with the following requirements:

1. Low-Sloped roofing less than or equal to 2:12 slope must have an SRI of at least 78.
2. Steep-Sloped roofing greater than 2:12 slope must have an SRI of at least 29.
3. Roofing Materials: Light-colored, reflective, and high-emissivity roofing helps to reduce localized heat build-up from roof surfaces that contribute to the urban heat island effect.

I. Elimination of CFCs AND HCFCs:

1. Extruded polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation shall not be manufactured with hydrochlorofluorocarbon (HCFC) blowing agents.

M. Salvaged or Reused materials: There shall be no substitutions for specified salvaged and reused materials and products.

1. Salvaged materials: Use of salvaged materials reduces impacts of disposal and manufacturing of replacements.

N. Recycled Content of Materials:

1. Provide building materials with recycled content such that post-consumer recycled content value plus half the pre-consumer recycled content value constitutes a minimum of 30% of the cost of materials used for the Project, exclusive of all MEP equipment, labor, and delivery costs. The Contractor shall make all attempts to maximize the procurement of materials with recycled content.
 - a. e post-consumer recycled content value of a material shall be determined by dividing the weight of post-consumer recycled content by the total weight of the material and multiplying by the cost of the material.
 - b. Do not include mechanical and electrical components in the calculations.
 - c. Do not include labor and delivery costs in the calculations.
 - d. Recycled content of materials shall be defined according to the Federal Trade Commission's "Guide for the Use of Environmental Marketing Claims," 16 CFR 260.7 (e).
 - e. Utilize all on-site existing paving materials that are scheduled for demolition as granulated fill, and include the cost of this

material had it been purchased in the calculations for recycled content value.

- f. The materials in the following list must contain the minimum recycled content indicated:

Category	Minimum Recycled Content
Aluminum Fabrications	35% combined
Rigid Insulation	20% pre-consumer

O. Biobased Content:

1. For products designated by the USDA's BioPreferred program, provide products that meet or exceed USDA recommendations for biobased content, so long as products meet all other performance requirements in VA master specifications. For more information regarding the product categories covered by the BioPreferred program, visit <http://www.biopreferred.gov>

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SECTION 02 41 00
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies selective demolition and removal of portions of building roof coverings, including membrane, flashing, insulation, other improvements and debris from the project limits.

1.2 RELATED WORK:

- A. Safety Requirements: Section 01 35 26 Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP).
- G. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- H. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- I. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it

results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.

- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
1. No wall or part of wall shall be permitted to fall outwardly from structures.
 2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the project area and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center; any damaged items shall be repaired or replaced as approved by the Contracting Officer Representative. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Contracting Officer Representative's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.
- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 DEMOLITION:

- A. Completely demolish and remove selected materials, including all appurtenances related or connected thereto.
- B. Debris, including roofing membranes, insulation, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer Representative.
- C. Remove and legally dispose of all materials, other than materials to remain as part of project work. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer Representative. When Utility lines are encountered that are not indicated on the drawings, the Contracting Officer Representative shall be notified prior to further work in that area.

3.2 CLEAN-UP:

On completion of work of this section and after removal of all debris, leave site in clean condition satisfactory to Contracting Officer Representative. Clean-up shall include off the Medical Center disposal of all items and materials not required to remain property of the Government as well as all debris and rubbish resulting from demolition operations.

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**SECTION 04 05 13
MASONRY MORTARING**

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies mortar materials and mixes.

1.2 RELATED WORK:

- A. Mortar used in Section:
 - 1. Section 04 05 16, MASONRY GROUTING.
 - 2. Section 04 20 00, UNIT MASONRY.
 - 4. Section 04 72 00, CAST STONE MASONRY.
- B. Mortar Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TESTING LABORATORY-CONTRACTOR RETAINED

- A. Engage a commercial testing laboratory approved by Contracting Officer Representative to perform tests specified below.
- B. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Contracting Officer Representative.

1.4 TESTS

- A. Test mortar and materials specified.
- B. Certified test reports.
- C. Identify materials by type, brand name and manufacturer or by origin.
- D. Do not use materials until laboratory test reports are approved by Contracting Officer Representative.
- E. After tests have been made and materials approved, do not change without additional test and approval of Contracting Officer Representative.
- F. Testing:
 - 1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
 - 2. Mortar:
 - a. Test for compressive strength and water retention; ASTM C270.
 - b. Mortar compressive strengths 28 days as follows:
 - Type M: Minimum 17230 kPa (2500 psi) at 28 days.
 - Type S: Minimum 12400 kPa (1800 psi) at 28 days.
 - Type N: Minimum 5170 kPa (750 psi) at 28 days.
 - 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.

- b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.
- 4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Certificates:
 - 1. Testing laboratory's facilities and qualifications of its technical personnel.
 - 2. Indicating that following items meet specifications:
 - a. Portland cement.
 - b. Masonry cement.
 - c. Mortar cement.
 - d. Hydrated lime.
 - e. Fine aggregate (sand).
- C. Laboratory Test Reports:
 - 1. Mortar, each type.
 - 2. Admixtures.
- D. Manufacturer's Literature and Data:
 - 1. Cement, each kind.
 - 2. Hydrated lime.
 - 3. Admixtures.
 - 4. Liquid acrylic resin.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.
- B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C40-04.....Organic Impurities in Fine Aggregates for Concrete
 - C91-05.....Masonry Cement
 - C109-08.....Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-MM Cube Specimens)

C144-04.....	Aggregate for Masonry Mortar
C150-09.....	Portland Cement
C207-06.....	Hydrated Lime for Masonry Purposes
C270-10.....	Mortar for Unit Masonry
C307-03(R2008).....	Tensile Strength of Chemical - Resistant Mortar, Grouts, and Monolithic Surfacing
C321-00(R2005).....	Bond Strength of Chemical-Resistant Mortars
C348-08.....	Flexural Strength of Hydraulic Cement Mortars
C595-10.....	Blended Hydraulic Cement
C780-10.....	Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
C979-10.....	Pigments for Integrally Colored Concrete
C1329-05.....	Mortar Cement

PART 2 - PRODUCTS

2.1 HYDRATED LIME

ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY MORTAR

A. ASTM C144 and as follows:

1. Light colored sand for mortar for laying face brick.
2. White plastering sand meeting sieve analysis for mortar joints for pointing

B. Test sand for color value in accordance with ASTM C40. Sand producing color darker than specified standard is unacceptable.

2.3 BLENDED HYDRAULIC CEMENT

ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT

A. ASTM C91. Type N, S, or M.

B. Use white masonry cement whenever white mortar is specified.

2.5 MORTAR CEMENT

ASTM C1329, Type N, S or M.

2.6 PORTLAND CEMENT

A. ASTM C150, Type I.

B. Use white Portland cement wherever white mortar is specified.

2.7 LIQUID ACRYLIC RESIN

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.8 WATER

Potable, free of substances that are detrimental to mortar, masonry, and metal.

2.9 POINTING MORTAR

A. For Cast Stone or Precast Concrete: Proportion by volume; One part white Portland cement, two parts white sand, and 1/5 part hydrated lime.

2.10 MASONRY MORTAR

A. Conform to ASTM C270.

B. Admixtures:

1. Do not use mortar admixtures, unless approved by Contracting Officer RepresentativeCOR.
2. Submit laboratory test report showing effect of proposed admixture on strength, water retention, and water repellency of mortar.
3. Do not use antifreeze compounds.

C. Colored Mortar:

1. Maintain uniform mortar color for exposed work throughout.
2. Match mortar color in approved sample or mock-up.
3. Color of mortar for exposed work in alteration work to match color of existing mortar unless specified otherwise in section 09 06 00, SCHEDULE FOR FINISHES.

D. Color Admixtures:

1. Proportion as specified by manufacturer.
2. For color, see Section 09 06 00, SCHEDULE FOR FINISHES.

2.11 HIGH BOND MORTAR

A. Mixture by volume, one-part Portland cement, 1/4-part hydrated lime, three-parts sand, water, and liquid acrylic resin.

B. Mortar properties when tested in accordance with referenced specifications.

1. Compressive Strength, ASTM C109: Minimum 19,305 kPa (2800 psi), using 50 mm (2 inch) cubes.
2. Tensile Strength, ASTM C307: 3861 kPa Minimum (560 psi), using the 25mm (1 inch) briquettes.
3. Flexural Strength, ASTM C348: Minimum 6067 kPa (880 psi), using flexural bar.
4. Bond Strength, ASTM C321: Minimum 2965 kPa (430 psi), using crossed brick.

2.12 COLOR ADMIXTURE

A. Pigments: ASTM C979.

B. Use mineral pigments only. Organic pigments are not acceptable.

- C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING

- A. Mix in a mechanically operated mortar mixer.
 - 1. Mix mortar for at least three minutes but not more than five minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.
- C. Mix water with dry ingredients in sufficient amount to provide a workable mixture which will adhere to vertical surfaces of masonry units.
- D. Mortar that has stiffened because of loss of water through evaporations:
 - 1. Re-tempered by adding water to restore to proper consistency and workability.
 - 2. Discard mortar that has reached its initial set or has not been used within two hours.
- E. Pointing Mortar:
 - 1. Mix dry ingredients with enough water to produce a damp mixture of workable consistency which will retain its shape when formed into a ball.
 - 2. Allow mortar to stand in dampened condition for one to 1-1/2 hours.
 - 3. Add water to bring mortar to a workable consistency prior to application.

3.2 MORTAR USE LOCATION

- B. Use Type S mortar for masonry containing vertical reinforcing bars setting cast stone.
- C. For brick veneer over frame back up walls, use Type N portland cement-lime mortar or Type S masonry cement or mortar cement mortar.
- D. Use Type N mortar for other masonry work, except as otherwise specified.
- E. Use Type N mortar for tuck pointing work.

- - - E N D - - -

SECTION 04 05 16
MASONRY GROUTING

PART 1 - GENERAL

1.1 DESCRIPTION:

Section specifies grout materials and mixes.

1.2 RELATED WORK:

- A. Grout used in Section:
 - 1. Section 04 20 00, UNIT MASONRY.
 - 2. Section 04 72 00, CAST STONE MASONRY.
- B. Grout Color: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 TESTS:

- A. Test grout and materials specified.
- B. Certified test reports.
- C. Identify materials by type, brand name and manufacturer or by origin.
- D. Do not use materials until laboratory test reports are approved by Contracting Officer Representative.
- E. After tests have been made and materials approved, do not change without additional test and approval of Contracting Officer Representative.
- F. Testing:
 - 1. Test materials proposed for use for compliance with specifications in accordance with test methods contained in referenced specifications and as follows:
 - 2. Grout:
 - a. Test for compressive strength; ASTM C1019.
 - b. Grout compressive strength of 13790 kPa (2000 psi) at 28 days.
 - 3. Cement:
 - a. Test for water soluble alkali (nonstaining) when nonstaining cement is specified.
 - b. Nonstaining cement shall contain not more than 0.03 percent water soluble alkali.
 - 4. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Certificates:
 - 1. Indicating that following items meet specifications:
 - a. Portland cement.

- b. Masonry cement.
 - c. Grout.
 - d. Hydrated lime.
 - e. Fine aggregate (sand).
 - f. Coarse aggregate for grout.
 - g. Color admixture.
- C. Laboratory Test Reports:
- 1. Grout, each type.
 - 2. Admixtures.
- D. Manufacturer's Literature and Data:
- 1. Cement, each kind.
 - 2. Hydrated lime.
 - 3. Admixtures.
 - 4. Liquid acrylic resin.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver masonry materials in original sealed containers marked with name of manufacturer and identification of contents.
- B. Store masonry materials under waterproof covers on planking clear of ground, and protect damage from handling, dirt, stain, water and wind.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - C40-04.....Organic Impurities in Fine Aggregates for
Concrete
 - C91-05.....Masonry Cement
 - C150-09.....Portland Cement
 - C207-06.....Hydrated Lime for Masonry Purposes
 - C404-07.....Aggregate for Masonry Grout
 - C476-10.....Grout for Masonry
 - C595-10.....Blended Hydraulic Cement
 - C979-10.....Pigments for Integrally Colored Concrete
 - C1019-11.....Sampling and Testing Grout

PART 2 - PRODUCTS

2.1 HYDRATED LIME:

ASTM C207, Type S.

2.2 AGGREGATE FOR MASONRY GROUT:

ASTM C404, Size 8.

2.3 BLENDED HYDRAULIC CEMENT:

ASTM C595, Type IS, IP.

2.4 MASONRY CEMENT:

A. ASTM C91. Type N, S, or M.

B. Use white masonry cement whenever white mortar is specified.

2.5 PORTLAND CEMENT:

A. ASTM C150, Type I.

B. Use white Portland cement wherever white mortar is specified.

2.6 LIQUID ACRYLIC RESIN:

A formulation of acrylic polymers and modifiers in liquid form designed for use as an additive for mortar to improve physical properties.

2.7 WATER:

Potable, free of substances that are detrimental to grout, masonry, and metal.

2.8 GROUT:

A. Conform to ASTM C476 except as specified.

B. Grout type proportioned by volume as follows:

1. Fine Grout:

a. Portland cement or blended hydraulic cement: one part.

b. Hydrated lime: 0 to 1/10 part.

c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.

2. Coarse Grout:

a. Portland cement or blended hydraulic cement: one part.

b. Hydrated lime: 0 to 1/10 part.

c. Fine aggregate: 2-1/4 to three times sum of volumes of cement and lime used.

d. Coarse aggregate: one to two times sum of volumes of cement and lime used.

3. Sum of volumes of fine and coarse aggregates: Do not exceed four times sum of volumes of cement and lime used.

2.9 COLOR ADMIXTURE:

A. Pigments: ASTM C979.

B. Use mineral pigments only. Organic pigments are not acceptable.

C. Pigments inert, stable to atmospheric conditions, nonfading, alkali resistant and water insoluble.

PART 3 - EXECUTION

3.1 MIXING:

A. Mix in a mechanically operated grout mixer.

1. Mix grout for at least five minutes.
- B. Measure ingredients by volume. Measure by the use of a container of known capacity.
- C. Mix water with grout dry ingredients in sufficient amount to bring grout mixture to a pouring consistency.

3.2 GROUT USE LOCATIONS:

- A. Use fine grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is 50 mm (2 inches) or less.
- B. Use either fine grout or coarse grout for filling wall cavities and cells of concrete masonry units where the smallest dimension is greater than 50 mm (2 inches).
- C. Do not use grout for filling bond beam or lintel units.

- - - E N D - - -

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for construction of masonry unit walls.

1.2 RELATED WORK

- A. Mortars: Section 04 05 13, MASONRY MORTARING, Section 04 05 16, MASONRY GROUTING.
- .
- B. Cavity insulation: Section 07 21 13, THERMAL INSULATION.
- C. Flashing: Section 07 60 00, FLASHING AND SHEET METAL.
- D. Sealants and sealant installation: Section 07 92 00, JOINT SEALANTS.
- E. Color and texture of masonry units: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Samples:
 - 1. Face brick, sample panel, 200 mm by 400 mm (8 inches by 16 inches,) showing full color range and texture of bricks, bond, and proposed mortar joints.
 - 2. Concrete masonry units, when exposed in finish work.
 - 4. Structural clay tile units.
 - 5. Glazed structural clay facing tile, clipped panels (triplicate) of four wall units with base units, showing color range, each color and texture.
- C. Shop Drawings:
 - 1. Special masonry shapes.
 - 2. Drawings, showing reinforcement, applicable dimensions and methods of hanging soffit or lintel masonry and reinforcing masonry for embedment of anchors for hung fixtures.
- D. Certificates:
 - 1. Certificates signed by manufacturer, including name and address of contractor, project location, and the quantity, and date or dates of shipment of delivery to which certificate applies.
 - 2. Indicating that the following items meet specification requirements:

- a. Face brick.
 - b. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
 - c. Ceramic glazed facing brick.
 - d. Glazed structural clay facing tile.
 - e. Structural clay tile units.
3. Testing laboratories facilities and qualifications of its principals and key personnel to perform tests specified.
- E. Laboratory Test Reports:
- 1. Brick for pre-built masonry panels.
 - 2. Ceramic glazed facing brick.
- F. Manufacturer's Literature and Data:
- 1. Anchors, ties, and reinforcement.
 - 2. Shear keys.
 - 3. Reinforcing bars.

1.4 WARRANTY

Warrant exterior masonry walls against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be five years.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
- A951-06.....Steel Wire for Masonry Joint Reinforcement.
 - A615/A615M-09.....Deformed and Plain Billet-Steel Bars for
Concrete Reinforcement.
 - A675/A675M-03(R2009)....Standard Specification for Steel Bars, Carbon,
Hot-Wrought, Special Quality, Mechanical
Properties
 - C34-03.....Structural Clay Load-Bearing Wall Tile
 - C55-09.....Concrete Building Brick
 - C56-10.....Structural Clay Non-Load-Bearing Tile
 - C62-10.....Building Brick (Solid Masonry Units Made From
Clay or Shale)

- C67-09.....Sampling and Testing Brick and Structural Clay
Tile
- C90-11.....Load-Bearing Concrete Masonry Units
- C126-10.....Ceramic Glazed Structural Clay Facing Tile,
Facing Brick, and Solid Masonry Units
- C216-10.....Facing Brick (Solid Masonry Units Made From
Clay or Shale)
- C476-10.....Standard Specification for Grout for Masonry
- C612-10.....Mineral Fiber Block and Board Thermal
Insulation
- C744-11.....Prefaced Concrete and Calcium Silicate Masonry
Units.
- D1056-07.....Flexible Cellular Materials - Sponge or
Expanded Rubber
- D2000-08.....Rubber Products in Automotive Applications
- D2240-05(R2010).....Rubber Property - Durometer Hardness
- D3574-08.....Flexible Cellular Materials-Slab, Bonded, and
Molded Urethane Foams
- F1667-11.....Fasteners: Nails, Spikes and Staples
- C. Masonry Industry Council:
Hot and Cold Weather Masonry Construction Manual-98 (R2000).
- D. American Welding Society (AWS):
D1.4-11 Structural Welding Code - Reinforcing Steel.
- E. Federal Specifications (FS):
FF-S-107C-00.....Screws, Tapping and Drive
- F. Brick Industry Association - Technical Notes on Brick Construction
(BIA):
11-2001.....Guide Specifications for Brick Masonry, Part I
11A-1988.....Guide Specifications for Brick Masonry, Part II
11B-1988.....Guide Specifications for Brick Masonry, Part
III Execution
11C-1998.....Guide Specification for Brick Masonry
Engineered Brick Masonry, Part IV
11D-1988.....Guide Specifications for Brick Masonry
Engineered Brick Masonry, Part IV continued

- G. Masonry Standards Joint Committee; Specifications for Masonry Structures TMS 602-08/ACI 530.1-08/ASCE 6-08 (2008 MSJC Book Version TMS-0402-08).

PART 2 - PRODUCTS

2.1 BRICK

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS.
2. Brick when tested in accordance with ASTM C67: Classified slightly efflorescent or better.
3. Size:
 - a. Modular

- B. Building Brick: ASTM C62, Grade MW for backup and interior work; Grade SW where in contact with earth.

2.4 SHEAR KEYS

- A. ASTM D2000, solid extruded cross-shaped section of rubber, neoprene, or polyvinyl chloride, with a durometer hardness of approximately 80 when tested in accordance with ASTM D2240, and a minimum shear strength of 3.5 MPa (500 psi).
- B. Shear key dimensions: Approximately 70 mm by 8 mm for long flange and 38 mm by 16 mm for short flange (2-3/4 inches by 5/16 inch for long flange, and 1-1/2 inches by 5/8 inch for short flange).

2.5 ANCHORS, TIES, AND REINFORCEMENT

- A. Steel Reinforcing Bars: ASTM A615M, deformed bars, grade as shown.

B. Joint Reinforcement:

1. Form from wire complying with ASTM A951.
2. Galvanized after fabrication.
3. Width of joint reinforcement 40 mm (0.16 inches) less than nominal width of masonry wall or partition.
4. Cross wires welded to longitudinal wires.
5. Joint reinforcement at least 3000 mm (10 feet) in length.
6. Joint reinforcement in rolls is not acceptable.
7. Joint reinforcement that is crimped to form drip is not acceptable.
8. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.

9. Ladder Design:
 - a. Longitudinal wires deformed 4 mm (0.16 inch) diameter wire.
 - b. Cross wires 2.6 mm (0.10 inch) diameter.
 10. Trussed Design:
 - a. Longitudinal and cross wires not less than 4 mm (0.16 inch nominal) diameter.
 - b. Longitudinal wires deformed.
 11. Multiple Wythes and Cavity wall ties:
 - a. Longitudinal wires 4 mm (0.16 inch), two in each wythe with ladder truss wires 4 mm (0.16 inch) overlay, welded to each longitudinal wire.
 - b. Longitudinal wires 4 mm (0.16 inch) with U shape 4 mm (0.16 inch) rectangular ties extending into other wythe not less than 75 mm (3 inches) spaced 400 mm o.c. (16 inches). Adjustable type with U shape tie designed to receive 4 mm (0.16 inch) pintle projecting into other wythe 75 mm (3 inches min.).
- C. Adjustable Veneer Anchor for Frame Walls:
1. Two piece, adjustable anchor and tie.
 2. Anchor and tie may be either type; use only one type throughout.
 3. Loop Type:
 - a. Anchor: Screw-on galvanized steel anchor strap 2.75 mm (0.11 inch) by 19 mm (3/4 inch) wide by 225 mm (9 inches) long, with 9 mm (0.35 inch) offset and 100 mm (4 inch) adjustment. Provide 5 mm (0.20 inch) hole at each end for fasteners.
 - b. Ties: Triangular tie, fabricated of 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Ties long enough to engage the anchor and be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer.
 4. Angle Type:
 - a. Anchor: Minimum 2 mm (16 gage) thick galvanized steel angle shaped anchor strap. Provide hole in vertical leg for fastener. Provide hole near end of outstanding leg to suit upstanding portion of tie.
 - b. Tie: Fabricate from 5 mm (0.20 inch) diameter galvanized cold drawn steel wire. Form "L" shape to be embedded not less than 50 mm (2 inches) into the bed joint of the masonry veneer and

provide upstanding leg to fit through hole in anchor and be long enough to allow 50 mm (2 inches) of vertical adjustment.

D. Dovetail Anchors:

1. Corrugated steel dovetail anchors formed of 1.5 mm (0.0598 inch) thick by 25 mm (1 inch) wide galvanized steel, 90 mm (3-1/2 inches) long where used to anchor 100 mm (4 inch) nominal thick masonry units, 140 mm (5-1/2 inches) long for masonry units more than 100 mm (4 inches) thick.
2. Triangular wire dovetail anchor 100 mm (4 inch) wide formed of 4 mm (9 gage) steel wire with galvanized steel dovetail insert. Anchor length to extend at least 75 mm (3 inches) into masonry, 25 mm (1 inch) into 40 mm (1-1/2 inch) thick units.
3. Form dovetail anchor slots from 0.6 mm (0.0239 inch) thick galvanized steel (with felt or fiber filler).

E. Individual ties:

1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to a rectangular shape not less than 50 mm (2 inches) wide by sufficient length for ends of ties to extend within 25 mm (1 inch) of each face of wall. Ties that are crimped to form drip are not permitted.
2. Adjustable Cavity Wall Ties:
 - a. Adjustable wall ties may be used at Contractor's option.
 - b. Two piece type permitting up to 40 mm (1-1/2 inch) adjustment.
 - c. Form ties from 5 mm (3/16 inch) diameter galvanized steel wire.
 - d. Form one piece to a rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into the bed joint 50 mm (2 inches).
 - e. Form the other piece to a 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having a 75 mm (3 inch) long bent section for engaging the 105 mm (4-1/8 inch) wide piece to form adjustable connection.

F. Wall Ties, (Mesh or Wire):

1. Mesh wall ties formed of ASTM A82, W0.5, 2 mm, (16 gage) galvanized steel wire 13 mm by 13 mm (1/2 inch by 1/2 inch) mesh, 75 mm (3 inches) wide by 200 mm (8 inches) long.
2. Rectangular wire wall ties formed of W1.4, 3 mm, (9 gage) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

2.6 PREFORMED COMPRESSIBLE JOINT FILLER

- A. Thickness and depth to fill the joint as specified.
- B. Closed Cell Neoprene: ASTM D1056, Type 2, Class A, Grade 1, B2F1.
- C. Non-Combustible Type: ASTM C612, Class 5, 1800 degrees F.

2.7 ACCESSORIES

- A. Weep Hole Wicks: Glass fiber ropes, 10 mm (3/8 inch) minimum diameter, 300 mm (12 inches) long.
- B. Box Board:
 - 1. Mineral Fiber Board: ASTM C612, Class 1.
 - 2. 25 mm (1 inch) thickness.
 - 3. Other spacing material having similar characteristics may be used subject to the COR's approval.
- C. Masonry Cleaner:
 - 1. Detergent type cleaner selected for each type masonry used.
 - 2. Acid cleaners are not acceptable.
 - 3. Use soapless type specially prepared for cleaning brick or concrete masonry as appropriate.
- D. Fasteners:
 - 1. Concrete Nails: ASTM F1667, Type I, Style 11, 19 mm (3/4 inch) minimum length.
 - 2. Masonry Nails: ASTM F1667, Type I, Style 17, 19 mm (3/4 inch) minimum length.
 - 3. Screws: FS-FF-S-107, Type A, AB, SF thread forming or cutting.

PART 3 - EXECUTION

3.1 JOB CONDITIONS

- A. Protection:
 - 1. Cover tops of walls with nonstaining waterproof covering, when work is not in progress. Secure to prevent wind blow off.
 - 2. On new work protect base of wall from mud, dirt, mortar droppings, and other materials that will stain face, until final work is completed.
- B. Cold Weather Protection:
 - 1. Masonry may be laid in freezing weather when methods of protection are utilized.
 - 2. Comply with MSJC and "Hot and Cold Weather Masonry Construction Manual".

3.2 CONSTRUCTION TOLERANCES

- A. Lay masonry units plumb, level and true to line within the tolerances as per MSJC requirements and as follows:
- B. Maximum variation from plumb:
 - 1. In 3000 mm (10 feet) - 6 mm (1/4 inch).
 - 2. In 6000 mm (20 feet) - 10 mm (3/8 inch).
 - 3. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- C. Maximum variation from level:
 - 1. In any bay or up to 6000 mm (20 feet) - 6 mm (1/4 inch).
 - 2. In 12 000 mm (40 feet) or more - 13 mm (1/2 inch).
- D. Maximum variation from linear building lines:
 - 1. In any bay or up to 6000 mm (20 feet) - 13 mm (1/2 inch).
 - 2. In 12 000 mm (40 feet) or more - 19 mm (3/4 inch).
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls from dimensions shown:
 - 1. Minus 6 mm (1/4 inch).
 - 2. Plus 13 mm (1/2 inch).
- F. Maximum variation in prepared opening dimensions:
 - 1. Accurate to minus 0 mm (0 inch).
 - 2. Plus 6 mm (1/4 inch).

3.3 INSTALLATION GENERAL

- A. Keep finish work free from mortar smears or spatters, and leave neat and clean.
- B. Anchor masonry as specified in Paragraph, ANCHORAGE.
- C. Wall Openings:
 - 1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
 - 2. If items are not available when walls are built, prepare openings for subsequent installation.
- D. Tooling Joints:
 - 1. Do not tool until mortar has stiffened enough to retain thumb print when thumb is pressed against mortar.
 - 2. Tool while mortar is soft enough to be compressed into joints and not raked out.
 - 3. Finish joints in exterior face masonry work with a jointing tool, and provide smooth, water-tight concave joint unless specified otherwise.

4. Tool Exposed interior joints in finish work concave unless specified otherwise.

E.

F. Wall, Furring, and Partition Units:

1. Lay out field units to provide for running bond of walls and partitions, with vertical joints in second course centering on first course units unless specified otherwise.
2. Align head joints of alternate vertical courses.
3. At sides of openings, balance head joints in each course on vertical center lines of openings.
4. Use no piece shorter than 100 mm (4 inches) long.
5. On interior partitions provide a 6 mm (1/4 inch) open joint for caulking between exterior walls, concrete work, and abutting masonry partitions.
6. Use not less than 100 mm (4 inches) nominal thick masonry for free standing furring unless shown otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

G. Use not less than 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless shown otherwise.

H. Before connecting new masonry with previously laid, remove loosened masonry or mortar, and clean and wet work in place as specified under wetting.

I. When new masonry partitions start on existing floors, machine cut existing floor finish material down to concrete surface.

J. Wetting and Wetting Test:

1. Test and wet brick or clay tile in accordance with BIA 11B.
2. Do not wet concrete masonry units or glazed structural facing tile before laying.

K. Temporary Formwork: Provide formwork and shores as required for temporary support of reinforced masonry elements.

L. Construct formwork to conform to shape, line and dimensions shown. Make sufficiently tight to prevent leakage of mortar, grout, or concrete (if any). Brace, tie and support as required to maintain position and shape during construction and curing of reinforced masonry.

- M. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and all other reasonable temporary loads that may be placed on them during construction.

3.4 ANCHORAGE

A. Veneer to Frame Walls:

1. Use adjustable veneer anchors.
2. Fasten anchor to stud through sheathing with self drilling and tapping screw, one at each end of loop type anchor.
3. Space anchors not more than 400 mm (16 inches) on center vertically at each stud.

B. Veneer to Concrete Walls:

1. Install dovetail slots in concrete vertically at 600 mm (2 feet) on centers.
2. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals.
3. Anchor new masonry facing to existing concrete with corrugated wall ties spaced at 400 mm, (16 inch) maximum vertical intervals, and at 600 mm (2 feet) maximum horizontal intervals. Fasten ties to concrete with power actuated fasteners or concrete nails.

C. Masonry Facing to Backup and Cavity Wall Ties:

1. Use individual ties for new work.
2. Stagger ties in alternate courses, and space at 400 mm (16 inches) maximum vertically, and 600 mm (2 feet) horizontally.
3. At openings, provide additional ties spaced not more than 900 mm (3 feet) apart vertically around perimeter of opening, and within 300 mm (12 inches) from edge of opening.
4. Anchor new masonry facing to existing masonry with corrugated wall ties spaced at 400 mm (16 inch) maximum vertical intervals and at every second masonry unit horizontally. Fasten ties to masonry with masonry nails.
5. Option: Use joint reinforcing for multiple wythes and cavity wall ties spaced not more than 400 mm (16 inches) vertically.
6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals not to

exceed 600 mm (24 inches) on center horizontally, and 400 mm (16 inches) on center vertically. Lay ties in the same line vertically in order to facilitate vibrating of the grout pours.

D. Anchorage of Abutting Masonry:

1. Anchor interior 100 mm (4 inch) thick masonry partitions to exterior masonry walls with wall ties. Space ties at 600 mm (2 foot) maximum vertical intervals. Extend ties 100 mm (4 inches) minimum into masonry.
2. Anchor interior masonry bearing walls or interior masonry partitions over 100 mm (4 inches) thick to masonry walls with rigid wall anchors spaced at 400 mm (16 inch) maximum vertical intervals.
3. Anchor abutting masonry walls and partitions to concrete with dovetail anchors. Install dovetail slots vertically in concrete at centerline of abutting wall or partition. Locate dovetail anchors at 400 mm (16 inch) maximum vertical intervals. Secure anchors to existing wall with two 9 mm (3/8 inch) by 75 mm (3 inch) expansion bolts or two power-driven fasteners.
4. Anchor abutting interior masonry partitions to existing concrete and existing masonry construction, with corrugated wall ties. Extend ties at least 100 mm (4 inches) into joints of new masonry. Fastened to existing concrete and masonry construction, with powder actuated drive pins, nail or other means that provides rigid anchorage. Install anchors at 400 mm (16 inch) maximum vertical intervals.

E. Masonry Furring:

1. Anchor masonry furring less than 100 mm (4 inches) nominal thick to masonry walls or to concrete with corrugated wall ties or dovetail anchors.
2. Space not over 600 mm (2 feet) on centers in both directions.

F. Anchorage to Steel Beams or Columns:

1. Use adjustable beam anchors on each flange.
2. At columns weld the 6 mm (1/4 inch) steel rod to steel columns at 300 mm (12 inch) intervals, and place wire ties in masonry courses at 400 mm (16 inches) maximum vertically.

3.5 REINFORCEMENT

A. Joint Reinforcement:

1. Use as joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing may be used in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Brick veneer over frame backing walls does not require joint reinforcement.
4. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
5. Additional joint reinforcement is required in mortar joints at both 200 mm (8 inches) and 400 (16 inches) above and below windows, doors, louvers and similar openings in masonry, except where other type anchors are required for anchorage of masonry to concrete structure.
6. Joint reinforcement is required in every other course of stack bond CMU masonry.
7. Wherever brick masonry is backed up with stacked bond masonry, joint reinforcement is required in every other course of CMU backup, and in corresponding joint of facing brick.

B. Steel Reinforcing Bars:

1. Install in cells of hollow masonry units where required for vertical reinforcement. Install in wall cavities of reinforced masonry walls where shown.
2. Use grade 60 bars if not specified otherwise.
- 3.

4. Stack Bond:

- a. Locate additional joint reinforcement in vertical and horizontal joints as shown.
- b. Anchor vertical reinforcement into the foundation or wall or bond beam below and hold in place.
- c. Provide temporary bracing for walls over 8 ft. tall until permanent horizontal bracing is completed.

5. Grout openings:

- a. Leave cleanout holes in double wythe walls during construction by omitting units at the base of one side of the wall.
- b. Locate 75 mm x 75 mm (3 in. x 3 in.) min. clean-out holes at location of vertical reinforcement.
- c. Keep grout space clean of mortar accumulation and sand debris. Clean the grout space every day using a high pressure jet stream of water, or compressed air, or industrial vacuum, or by laying wood strips on the metal ties as the wall is built. If wood strips are used, lift strips with wires as the wall progresses and before placing each succeeding course of wall ties.

3.6 BRICK EXPANSION AND CMU CONTROL JOINTS.

- A. Provide brick expansion (BEJ) to continue existing construction and where shown on drawings.
- B. Keep joint free of mortar and other debris.
- C. Where joints occur in masonry walls.
 1. Install preformed compressible joint filler in brick wythe.
 2. Install cross shaped shear keys in concrete masonry unit wythe with preformed compressible joint filler on each side of shear key unless otherwise specified.
 3. Install filler, backer rod, and sealant on exposed faces.
- D. E. Interrupt steel joint reinforcement at expansion and control joints unless otherwise shown.
- F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.7 BUILDING EXPANSION AND SEISMIC JOINTS

- A. Keep joint free of mortar. Remove mortar and other debris.
- B. Install non-combustible, compressible type joint filler to fill space completely except where sealant is shown on joints in exposed finish work.
- C. Where joints are on exposed faces, provide depth for backer rod and sealant as specified in Section 07 92 00, JOINT SEALANTS, unless shown otherwise.

3.8 ISOLATION SEAL

- A. Where full height walls or partitions lie parallel or perpendicular to and under structural beams or shelf angles, provide a separation

between walls or partitions and bottom of beams or shelf angles not less than the masonry joint thickness unless shown otherwise.

- B. Insert in the separation, a continuous full width strip of non-combustible type compressible joint filler.
- C. Where exposed in finish work, cut back filler material in the joint enough to allow for the joint to be filled with sealant material specified in Section 07 92 00, JOINT SEALANTS.

3.9 BRICKWORK

- A. Lay clay brick in accordance with BIA Technical Note 11 series.
- B. Laying:
 - 1. Lay brick in running bond with course of masonry bonded at corners unless shown otherwise. Match bond of existing building.
 - 2. Maintain bond pattern throughout.
 - 3. Do not use brick smaller than half-brick at any angle, corner, break or jamb.
 - 4. Where length of cut brick is greater than one half but less than a whole brick, maintain the vertical joint location of such units.
 - 5. Lay exposed brickwork joints symmetrical about center lines of openings.
 - 6. Do not structural bond multi wythe brick walls unless shown.
 - 7. Before starting work, lay facing brick on foundation wall and adjust bond to openings, angles, and corners.
 - 8. Lay brick for sills with wash and drip.
 - 9. Build solid brickwork as required for anchorage of items.
- C. Joints:
 - 1. Exterior and interior joint widths: Lay for three equal joints in 200 mm (eight inches) vertically, unless shown otherwise.
 - 2. Rake joints for pointing with colored mortar when colored mortar is not full depth.
 - 3. Arches:
 - a. Flat arches (jack arches) lay with camber of 1 in 200 (1/16 inch per foot) of span.
 - b. Face radial arches with radial brick with center line of joints on radial lines.
 - c. Form Radial joints of equal width.
 - d. Bond arches into backing with metal ties in every other joint.
- D. Weep Holes:

1. Install weep holes at 600 mm (24 inches) on center in bottom of vertical joints of exterior masonry veneer or cavity wall facing over foundations, bond beams, and other water stops in the wall.
 2. Form weep holes using wicks made of mineral fiber insulation strips turned up 200 mm (8 inches) in cavity. Anchor top of strip to backup to securely hold in place.
 3. Install sand or pea gravel in cavity approximately 75 mm (3 inches) high between weep holes.
- E. Solid Exterior Walls: Rebuild existing construction
- F. Cavity Type Exterior Walls: Rebuild existing construction;
1. Keep air space clean of mortar accumulations and debris.
 - a. Clean cavity by use of hard rubber, wood or metal channel strips having soft material on sides contacting wythes.
 - b. Lift strips with wires before placing next courses of horizontal joint reinforcement or individual ties or adjustable cavity wall ties.
 2. Insulated Cavity Type Exterior Walls:
 - a. Install the insulation against the cavity face of inner masonry wythe.
 - b. Place insulation between rows of ties or joint reinforcing or bond to masonry surface with a bonding agent as recommended by the manufacturer of the insulation.
 - c. Lay the outer masonry wythe up with an air space between insulation and masonry units.
 3. Veneer Framed Walls:
 - a. Build with 100 mm (4 inches) of face brick over sheathed stud wall with air space.
 - b. Keep air space clean of mortar accumulations and debris.
- G. Low-Lift Grouting:
1. Use Low-Lift grouting technique with "Fine Grout" per ASTM C476 for the following:
 - a. Two-wythe walls with grout space of 50 mm (2 inch) or less in width.
 - b. Multi-wythe walls.

- c. Columns, piers or pilasters where masonry units are shown in core areas enclosed by exterior masonry units.
2. At Contractor's option, low-lift grouting technique may be used for reinforced masonry construction with grout spaces wider than 50 mm (2 inches), except use "Coarse Grout" mix per ASTM C476 and place in lifts not to exceed 200 mm (8 inches) in height.
3. Construct low-lift masonry by placing reinforcement, laying masonry units and pouring grout as the work progresses.
4. Place vertical reinforcement bars and supports prior to laying of masonry units. Extend above elevation of maximum pour height as required to allow for splicing. Horizontal reinforcement bars may be placed progressively with laying of masonry units.
5. Limit grout pours as required to prevent displacement of masonry by grout pressures (blowout), but do not exceed 1220 mm (4 feet) pour height.
6. Lay masonry units prior to each grout pour, but do not construct more than 300 mm (12 inches) above maximum grout pour height in one exterior wythe and 100 mm (4 inches) above in other exterior wythe. Provide metal wall ties if required to prevent blowouts.
7. Pour grout using container with spout and consolidate immediately by rodding or puddling; do not use trowels. Place grout continuously; do not interrupt pouring of grout for more than one hour. If poured in lifts, place from center-to-center of masonry courses. Terminate pour 38 mm (1 1/2 inches) below top of highest course in pour.

3.17 CLEANING AND REPAIR

A. General:

1. Clean exposed masonry surfaces on completion.
2. Protect adjoining construction materials and landscaping during cleaning operations.
3. Cut out defective exposed new joints to depth of approximately 19 mm (3/4 inch) and repoint.
4. Remove mortar droppings and other foreign substances from wall surfaces.

B. Brickwork:

1. First wet surfaces with clean water, then wash down with a solution of soapless detergent. Do not use muriatic acid.

2. Brush with stiff fiber brushes while washing, and immediately thereafter hose down with clean water.
3. Free clean surfaces of traces of detergent, foreign streaks, or stains of any nature.

C

D. Glazed Structural Facing Tile or Brick Units:

1. Clean as recommended by tile or brick manufacturer. Protect light colored mortar joints from discoloration during cleaning.
2. Prepare schedule of test locations.

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**SECTION 04 72 00
CAST STONE MASONRY**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This sections specifies manufactured concrete units to simulate a natural stone as required to replace existing caps or accent bands.
- B. Reinstallation of existing cast stone units.
- C. Installation of cast stone units.

1.2 RELATED WORK

- A. Setting and pointing mortar: Section 04 05 13, MASONRY MORTARING / Section 04 05 16, MASONRY GROUTING.
- B. Joint sealant and application: Section 07 92 00, JOINT SEALANTS.
- C. Color and texture specified in Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Cast stone, sample panel, size 100 by 300 by 300 mm (4 by 12 by 12 inches) each color and finish.
- C. Shop Drawings:
 - 1. Cast stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
 - 2. Setting drawings with setting mark.
- D. Certificates: Test results indicating that the cast stone meets specification requirements and proof of plant certification.
- E. Submit manufacturers test results of cast stone previously made by manufacturer.
- F. Laboratory Data: Description of testing laboratories facilities and qualifications of its principals and key personnel.
- G. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store cast stone under waterproof covers on planking clear of ground.
- B. Protect from handling, dirt, stain, and water damage.
- C. Mark production units with the identification marks as shown on the shop drawings.

- D. Package units and protect them from staining or damage during shipping and storage.
- E. Provide an itemized list of product to support the bill of lading.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.
- C. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - A185-07.....Steel, Welded Wire Fabric, Plain for Concrete
 - A615/A615M-09.....Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
 - C33-11.....Concrete Aggregates
 - C150-09.....Portland Cement
 - C503-10.....Marble Dimension Stone (Exterior)
 - C568-10.....Limestone Dimension Stone
 - C615-11.....Granite Dimension Stone
 - C616-10.....Quartz-Based Dimension Stone
 - C979-10.....Pigments for Integrally Colored Concrete
 - C1194-03.....Compressive Strength of Architectural Cast Stone
 - C1195-03.....Absorption of Architectural Cast Stone
 - C1364-10.....Architectural Cast Stone.
 - D2244-09.....Calculation of Color Differences from Instrumentally Measured Color Coordinates.

1.7 QUALITY ASSURANCE

- A. The Manufacturer:
 - 1. Must have 5 years minimum continuous operating experience and have facilities for manufacturing cast stone as described herein. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of cast stone required in accordance with the project schedule.
 - 2. Must be a member of the Cast Stone Institute.

3. Must have a certified plant (certification by the Cast Stone Institute).
- B. Stone setter: Must have 5 years' experience setting cast or natural building stone.
- C. Testing: One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14 m³) delivered to the job:
 1. Three (3) field cut cube specimens from each of these sample shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as specified.
 2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.
 4. Manufacturer shall submit a written list of projects similar and at least three (3) years of age, along with VA -COR, architect and contractor references.

1.8 MANUFACTURING TOLERANCES

- A. Cross section dimensions shall not deviate by more than + 1/8 in. (3 mm) from approved dimension.
- B. Length of units shall not deviate by more than length /360 or + 1/8 in. (3mm), whichever is greater, not to exceed + 1/4 in (6 mm). Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.
- C. Warp bow or twist of units shall not exceed length/360 or + 1/8 in. (3 mm), whichever is greater.
- D. Location of dowel holes, anchor slots, flashing grooves, false joints and similar features - On formed sides of unit, 1/8 in (3 mm), on unformed sides of unit, 3/8 in (9 mm) maximum deviation.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CAST STONE

- A. Existing stone cap or wall units, salvaged from the work.
- B. Comply with ASTM C 1364
- C. Physical properties: Provide the following:
 1. Compressive Strength - ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

2. Absorption - ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products as 28 days.
 3. Air Content - ASTM C173 or C231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for vibrant dry tamp (VDT) products.
 4. Freeze thaw - ASTM C 1364L The cumulative percent weight loss (CPWL) shall be less than 5% after 300 cycles of freezing and thawing.
 5. Linear Shrinkage - ASTM C 426L Shrinkage shall not exceed 0.065%.
- D. Job site testing - One (1) sample from production units may be selected at random from the field for each 500 cubic feet (14m³) delivered to the job site:
1. Three (3) field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.
 2. Three (3) field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.
 3. Field specimens shall be tested in accordance with ASTM C 1194 and C 1195.

2.2 RAW MATERIALS

- A. Portland cement - Type I or Type III, white and/or grey, ASTM C 150.
- B. Coarse aggregates - Granite, quartz or limestone, ASTM C 33, except for gradation, and are optional for the vibrant dry tamp (VDT) casting method.
- C. Fine aggregates - Manufactured or natural sands, ASTM C 33, except for gradation.
- D. Colors - Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.
- E. Admixtures- Comply with the following:
 1. ASTM C 260 for air-entraining admixtures.
 2. ASTM C 494/C 495 M Types A-G for water reducing, retarding, accelerating and high range admixtures.
 3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.

4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water - Potable

G. Reinforcing bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in. (37 mm).

2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.

2.3 COLOR AND FINISH

A. Match sample existing on site.

B. All surfaces intended to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. (0.8 mm) and the density of such voids shall be less than 3 occurrences per any 1 in² (25mm²) and not obvious under direct daylight illumination at a 5 ft. (1.5m) distance.

C. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 ft (3m) distance.

D. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

1. Total color difference - not greater than 6 units.

2. Total hue difference-not greater than 2 units.

2.4 REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

1. Minimum reinforcing shall be 0.25 percent of the cross section area.

B. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5in. (38 mm) of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

- C. Minor chipping resulting from shipment and delivery shall not be grounds for rejection. Minor chips shall not be obvious under direct daylight illumination from a 20-ft (6m) distance.
- D. The occurrence of crazing or efflorescence shall not constitute a cause for rejection.
- E. Remove cement film, if required, from exposed surface prior to packaging for shipment.

2.5 CURING

Cure units in a warm curing chamber 100 F (37.8 C) at 95 percent relative humidity for approximately 12hours, or cure in a 95 percent moist environment at a minimum 70F (21.1 C) for 16 hours after casting. Additional yard curing at 95 percent relative humidity shall be 350-degree-days (i.e. 7 days @ 50F (10.0 C) or 5 days @ 70F (21.0 C) prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Contractor re-installing existing units shall check materials for cracks, quality, refit, completed cleaning and finish prior to installation. Do not set unacceptable units.
- B. Installing contractor shall check cast stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2 SETTING TOLERANCES

- A. Comply with Cast Stone Institute SM Technical Manual.
- B. Set stones 1/8 in. (3 mm) or less, within the plane of adjacent units.
- C. Joints, plus - 1/6 in. (1.5 mm), minus - 1/8 in. (3 mm).

3.3 JOINTING

- A. Joint size:
 - 1. At stone/brick joints 3/8 in. (9.5 cm).
 - 2. At stone/stone joints in vertical position 1/4 in. (6 mm) (3/8 in. (9.5 mm) optional).
 - 3. Stone/stone joint exposed on top 3/8 in. (.5 mm).
- B. Joint Materials:
 - 1. Mortar, Type N, ASTM C 270.
 - 2. Use a full bed of mortar at all bed joints.
 - 3. Flush vertical joints full with mortar.

4. Leave all joints with exposed tops or under relieving angles open for sealant.

5. Leave head joints in coping and projecting components open for sealant.

B. Location of joints:

1. Match existing pattern and length of units.

2. At control and expansion joints unless otherwise shown.

3.4 SETTING

A. Drench units with clean water prior to setting.

B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

C. Set units in full bed of mortar, unless otherwise detailed.

D. Rake mortar joints 3/4 in. (18 mm) in. for pointing.

E. Remove excess mortar from unit faces immediately after setting.

F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

A. Comply with requirements of Section 07 92 00, JOINT SEALANTS.

B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

Inspect finished installation according to Bulletin #36 published by the Cast Stone Institute.

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SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies structural steel shown and classified by Section 2, Code of Standard Practice for Steel Buildings and Bridges.

1.2 RELATED WORK:

A. Steel Decking: Section 05 31 00, STEEL DECKING.

1.3 QUALITY ASSURANCE:

A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Std fabrication plant.

1.4 TOLERANCES:

Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by AISC 303, Sections 6 and 7, Code of Standard Practice for Buildings and Bridges, except as follows:

A. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch).

1.5 DESIGN:

A. Connections: Design and detail all connections for each member size, steel grade and connection type as indicated on the drawings. Use details consistent with the details shown on the Drawings, supplementing where necessary. The details shown on the Drawings are conceptual and do not indicate the required weld sizes or number of bolts unless specifically noted. Use rational engineering design and standard practice in detailing, accounting for all loads and eccentricities in both the connection and the members. Promptly notify the COR of any location where the connection design criteria is not clearly indicated. The design of all connections is subject to the review and acceptance of the COR. Submit structural calculations prepared and sealed by a qualified engineer registered in the state where the project is located. Submit calculations for review before preparation of detail drawings.

1.6 REGULATORY REQUIREMENTS:

- A. AISC 360: Specification for Structural Steel Buildings
- B. AISC 303: Code of Standard Practice for Steel Buildings and Bridges.

1.7 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop and Erection Drawings: Complete
- C. Certificates:
 - 1. Structural steel.
 - 2. Steel for all connections.
 - 3. Welding materials.
 - 4. Shop coat primer paint.
- D. Test Reports:
 - 1. Welders' qualifying tests.
- E. Design Calculations and Drawings:
 - 1. Connection calculations, if required.
- F. Record Surveys.

1.8 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Institute of Steel Construction (AISC):
 - 1. AISC 360-10 Specification for Structural Steel Buildings
 - 3. AISC 303-10 Code of Standard Practice for Steel Buildings and Bridges
- C. American National Standards Institute (ANSI):
 - B18.22.1-65(R2008).....Plain Washers
 - B18.22M-81(R2000).....Metric Plain Washers
- D. American Society for Testing and Materials (ASTM):
 - A6/A6M-11.....Standard Specification for General Requirements
for Rolled Structural Steel Bars, Plates,
Shapes, and Sheet Piling
 - A36/A36M-08.....Standard Specification for Carbon Structural
Steel
 - A53/A53M-10.....Standard Specification for Pipe, Steel, Black
and Hot-Dipped, Zinc-Coated Welded and Seamless
 - A123/A123M-09.....Standard Specification for Zinc (Hot-Dip
Galvanized) Coatings on Iron and Steel Products
 - A242/A242M-04(R2009)....Standard Specification for High-Strength Low-
Alloy Structural Steel
 - A283/A283M-03(R2007)....Standard Specification for Low and Intermediate
Tensile Strength Carbon Steel Plates

- A307-10.....Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
- A325-10.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- A490-12.....Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength
- A500/A500M-10a.....Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A501-07.....Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- A572/A572M-07.....Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- A992/A992M-11.....Standard Specification for Structural Steel Shapes
- E. American Welding Society (AWS):
 - D1.1/D1.1M-10.....Structural Welding Code-Steel
- F. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
 - Specification for Structural Joints Using ASTM A325 or A490 Bolts
- G. Military Specifications (Mil. Spec.):
 - MIL-P-21035.....Paint, High Zinc Dust Content, Galvanizing, Repair
- H. Occupational Safety and Health Administration (OSHA):
 - 29 CFR Part 1926-2001...Safety Standards for Steel Erection

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Structural Steel: ASTM A36 & A992.
- E. Bolts, Nuts and Washers:
 - 1. High-strength bolts, including nuts and washers: ASTM A325.
 - 2. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.
- F. Zinc Coating: ASTM A123.
- G. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.

PART 3 - EXECUTION

3.1 CONNECTIONS (SHOP AND FIELD):

- A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
- B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than 70% of their minimum tensile strength. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators. Twist-off torque bolts are not an acceptable alternate fastener for slip critical connections.

3.2 FABRICATION:

Fabrication in accordance with Chapter M, AISC 360. .

3.3 SHOP PAINTING:

- A. General: Shop paint steel with primer in accordance with AISC 303, Section 6.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
 - 2. Surfaces which will be encased in concrete.
 - 3. Surfaces which will receive sprayed on fireproofing.
 - 4. Top flange of members which will have shear connector studs applied.
- E. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

3.4 ERECTION:

- A. General: Erection in accordance with AISC 303, Section 7B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with AISC 303, Section 7

3.5 FIELD PAINTING:

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.

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SECTION 05 31 00
STEEL DECKING

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies material and services required for installation of steel decking as shown and specified.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Steel Framing: Section 05 12 00, STRUCTURAL STEEL FRAMING

1.3 DESIGN REQUIREMENTS:

- A. Design steel decking in accordance with AISI publication, "Specification for the Design of Cold-formed Steel Structural Members" except as otherwise shown or specified.
- B. Design all elements with the latest published version of applicable codes.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.
- D. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".
- E. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE:

- A. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A36/A36M-08.....Standard Specification for Carbon Structural Steel
 - ASTM A1008/A1008M-12....Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - A653/A653M-11.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
 - C423-09a.....Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
 - 360-10.....Specification for Structural Steel Buildings.
- D. American Iron and Steel Institute (AISI):
 - S100-07.....North American Specification for the Design of Cold-Formed Steel Structural Members, 2007 Edition with Supplement 2.aisc
- E. American Welding Society (AWS):
 - D1.3-08.....Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
 - 1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement
 - 2. Factory Mutual Research Approval Guide (2002)
- G. Military Specifications (Mil. Spec.)
 - MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Steel Decking: ASTM A653, Structural Quality.
- B. Galvanizing: ASTM A653, G90.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- E. Miscellaneous Steel Shapes: ASTM A36.
- F. Welding Electrode: E60XX minimum.
- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 - 2. Seat Angles for Deck: Provide where a beam does not frame into a column.
 - 3. Sump Pans for Roof Drains: Fabricated from single piece of minimum 1.9 mm (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 75 mm (3 inches) wide. Recess pans not less than 38 mm (1 1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

2.2 REQUIREMENTS:

- A. Provide steel decking of the type, depth, gauge, and section properties as shown.
- C. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth, type, Rib and minimum gage requirements as shown on the Contract Documents.
 - 1. Finish: Galvanized G-90.
 - 2. Finish: Prime painted. Apply finished coat of paint to underside of deck after installation. Color white.
- D. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light

fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

PART 3 - EXECUTION

3.1 ERECTION:

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded. Steel angle frame and roof deck maybe shop or rig assembled and moved into place for installation. Contractor is responsible for means, methods and verifying all measurements for prefabricated angle frames and deck assemblies.
- B. Do not use deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- C. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- D. Fastening Deck Units as indicated, and:
 1. Fasten roof deck units to steel supporting members by not less than 16 mm (5/8 inch) diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. at every support. Power driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
 2. Provide any additional fastening necessary to comply with the requirements of Underwriters Laboratories and/or Factory Mutual to achieve the required ratings.
 3. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 1.4 kPa (30 psf) for other roof areas.
- G. Cutting and Fitting:
 1. Cut all metal deck units to proper length in the shop prior to shipping.
 2. Penetrations shown on the approved metal deck shop drawings but not shown on the Structural Drawings are to be located, cut and reinforced by the trade requiring the opening.

3. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
4. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the COR. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
5. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking, and support of other work shown.

3.2 WELDING:

Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.3.

3.3 FIELD REPAIR:

1. Areas scarred during erection.
2. Welds to be thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint.

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies wood blocking, framing, sheathing, furring, nailers, rough hardware.

1.2 RELATED WORK:

- A. Sustainable design requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.
- C. Manufacturer's Literature and Data:
 - 1. Submit data for lumber, panels, hardware and adhesives.
 - 2. Submit data for wood-preserved treatment from chemical treatment manufacturer and certification from treating plants that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 3. Submit 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.
 - 4. For products receiving a waterborne treatment, submit statement that moisture content of treated materials was reduced to levels specified before shipment to project site.
- E. Manufacturer's certificate for unmarked lumber.

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Protect lumber and other products from dampness both during and after delivery at site.
- B. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.
- C. Stack plywood and other board products so as to prevent warping.

- D. Locate stacks on well drained areas, supported at least 152 mm (6 inches) above grade and cover with well-ventilated sheds having firmly constructed over hanging roof with sufficient end wall to protect lumber from driving rain.

1.5 QUALITY ASSURANCE:

- A. Installer: A firm with a minimum of three (3) years' experience in the type of work required by this section.

1.6 GRADING AND MARKINGS:

- A. Any unmarked lumber or plywood panel for its grade and species will not be allowed on VA Construction sites for lumber and material not normally grade marked, provide manufacturer's certificates (approved by an American Lumber Standards approved agency) attesting that lumber and material meet the specified the specified requirements.

1.7 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in the text by basic designation only.
- B. American Forest and Paper Association (AFPA):
 - NDS-15.....National Design Specification for Wood Construction
 - WCD1-01.....Details for Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
 - A190.1-07.....Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
 - B18.2.1-12(R2013).....Square and Hex Bolts and Screws
 - B18.2.2-10.....Square and Hex Nuts
 - B18.6.1-81(R2008).....Wood Screws
- E. American Plywood Association (APA):
 - E30-11.....Engineered Wood Construction Guide
- F. ASTM International (ASTM):
 - A653/A653M-13.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - C954-11.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel

- Studs from 0.033 inch (2.24 mm) to 0.112-inch
(2.84 mm) in thickness
- C1002-14.....Steel Self-Piercing Tapping Screws for the
Application of Gypsum Panel Products or Metal
Plaster Bases to Wood Studs or Metal Studs
- D198-14.....Test Methods of Static Tests of Lumber in
Structural Sizes
- D2344/D2344M-13.....Test Method for Short-Beam Strength of Polymer
Matrix Composite Materials and Their Laminates
- D2559-12a.....Adhesives for Structural Laminated Wood
Products for Use Under Exterior (Wet Use)
Exposure Conditions
- D3498-03(R2011).....Adhesives for Field-Gluing Plywood to Lumber
Framing for Floor Systems
- D6108-13.....Test Method for Compressive Properties of
Plastic Lumber and Shapes
- D6109-13.....Test Methods for Flexural Properties of
Unreinforced and Reinforced Plastic Lumber and
Related Products
- D6111-13a.....Test Method for Bulk Density and Specific
Gravity of Plastic Lumber and Shapes by
Displacement
- D6112-13.....Test Methods for Compressive and Flexural Creep
and Creep-Rupture of Plastic Lumber and Shapes
- F844-07a(R2013).....Washers, Steel, Plan (Flat) Unhardened for
General Use
- F1667-13.....Nails, Spikes, and Staples
- G. American Wood Protection Association (AWPA):
AWPA Book of Standards
- H. Commercial Item Description (CID):
A-A-55615.....Shield, Expansion (Wood Screw and Lag Bolt Self
Threading Anchors)
- I. Forest Stewardship Council (FSC):
FSC-STD-01-001(Ver. 4-0)FSC Principles and Criteria for Forest
Stewardship
- J. Military Specification (Mil. Spec.):
MIL-L-19140E.....Lumber and Plywood, Fire-Retardant Treated

- K. Environmental Protection Agency (EPA):
 - 40 CFR 59(2014).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products
- L. Truss Plate Institute (TPI):
 - TPI-85.....Metal Plate Connected Wood Trusses
- M. U.S. Department of Commerce Product Standard (PS)
 - PS 1-95.....Construction and Industrial Plywood
 - PS 20-10.....American Softwood Lumber Standard
- N. ICC Evaluation Service (ICC ES):
 - AC09.....Quality Control of Wood Shakes and Shingles
 - AC174.....Deck Board Span Ratings and Guardrail Systems
(Guards and Handrails)

PART 2 - PRODUCTS

2.1 LUMBER:

- A. Unless otherwise specified, each piece of lumber must bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
 - 1. Identifying marks are to be in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Lumber Other Than Structural:
 - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
 - 2. Framing lumber: Minimum extreme fiber stress in bending of 7584 kPa (1100 PSI).
 - 3. Furring, blocking, nailers and similar items 101 mm (4 inches) and narrower Standard Grade; and, members 152 mm (6 inches) and wider, Number 2 Grade.
- C. Sizes:
 - 1. Conforming to PS 20.

2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.

D. Moisture Content:

1. Maximum moisture content of wood products is to be as follows at the time of delivery to site.
 - a. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
 - b. Lumber over 50 mm (2 inches) thick: 25 percent or less.

E. Fire Retardant Treatment:

1. Comply with Mil Spec. MIL-L-19140.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

F. Preservative Treatment:

1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 610 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members provided in connection with roofing and flashing materials.
3. Treat other members specified as preservative treated (PT).
4. Preservative treat by the pressure method complying with AWPA Book use category system standards U1 and T1, except any process involving the use of Chromated Copper Arsenate (CCA) or other agents classified as carcinogenic for pressure treating wood is not permitted.

2.2 ROUGH HARDWARE AND ADHESIVES:

A. Anchor Bolts:

1. ASME B18.2.1 and ASME B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
2. Extend at least 203 mm (8 inches) into masonry or concrete with ends bent 50 mm (2 inches).

- B. Miscellaneous Bolts: Expansion Bolts: C1D A-A-55615; lag bolt, long enough to extend at least 65 mm (2-1/2 inches) into masonry or concrete. Provide 13 mm (1/2 inch) bolt unless shown otherwise.
- C. Washers
1. ASTM F844.
 2. Provide zinc or cadmium coated steel or cast iron for washers exposed to weather.
- D. Screws:
1. Wood to Wood: ASME B18.6.1 or ASTM C1002.
 2. Wood to Steel: ASTM C954, or ASTM C1002.
- E. Nails:
1. Size and type best suited for purpose unless noted otherwise. Provide aluminum-alloy nails, plated nails, or zinc-coated nails, for nailing wood work exposed to weather and on roof blocking.
 2. ASTM F1667:
 - a. Common: Type I, Style 10.
 - b. Concrete: Type I, Style 11.
 - c. Barbed: Type I, Style 26.
 - d. Underlayment: Type I, Style 25.
 - e. Masonry: Type I, Style 27.
 - f. Provide special nails designed for use with ties, strap anchors, framing connectors, joists hangers, and similar items. Nails not less than 32 mm (1-1/4 inches) long, 8d and deformed or annular ring shank.
- G. Adhesives:
1. For field-gluing plywood to lumber framing floor or roof systems: ASTM D3498.
 2. Adhesives to have a VOC content of 90 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

- A. Conform to applicable requirements of the following:
1. AFPA NDS for timber connectors.
 2. AITC A190.1 Timber Construction Manual for heavy timber construction.
 3. AFPA WCD1 for nailing and framing unless specified otherwise.

4. APA for installation of plywood or structural use panels.
5. TPI for metal plate connected wood trusses.

B. Fasteners:

1. Nails.

- a. Nail in accordance with the Recommended Nailing Schedule as specified in AFPA WCD1 where detailed nailing requirements are not specified in nailing schedule. Select nail size and nail spacing sufficient to develop adequate strength for the connection without splitting the members.
- b. Use special nails with framing connectors.
- d. Use 8d or larger nails for nailing through 25 mm (1 inch) thick lumber and for toe nailing 50 mm (2 inch) thick lumber.
- e. Use 16d or larger nails for nailing through 50 mm (2 inch) thick lumber.
- f. Select the size and number of nails in accordance with the Nailing Schedule except for special nails with framing anchors.
- g. Nailing Schedule; Using Common Nails:
 - 1) Joist bearing on sill or girder, toe nail three (3) 8d nails or framing anchor.
 - 2) Bridging to joist, toe nail each end two (2) 8d nails.
 - 3) Ledger strip to beam or girder three (3) 16d nails under each joint.

2. Bolts:

- a. Fit bolt heads and nuts bearing on wood with washers.
- b. Countersink bolt heads flush with the surface of nailers.
- c. Embed in concrete and solid masonry or provide expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
- d. Provide toggle bolts to hollow masonry or sheet metal.
- e. Provide bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 610 mm (24 inch) intervals between end bolts. Provide clips to beam flanges.

3. Power actuated drive pins may be provided where practical to anchor to solid masonry, concrete, or steel.

4. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Provide metal plugs, inserts or similar fastening.
5. Screws to Join Wood:
 - a. Where shown or option to nails.
 - b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
 - c. Spaced same as nails.
- C. Set sills or plates level in full bed of mortar on masonry or concrete walls.
 1. Space anchor bolts 1219 mm (4 feet) on centers between ends and within 152 mm (6 inches) of end. Stagger bolts from side to side on plates over 178 mm (7 inches) in width.
 2. Provide shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
 3. Closely fit, and set to required lines.
- D. Cut notch, or bore in accordance with AFPA WCD1 passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- E. Blocking Nailers, and Furring:
 1. Install furring, blocking, nailers, and grounds where shown.
 2. Provide longest lengths practicable.
 3. Provide fire retardant treated wood blocking where shown at openings and where shown or specified.
 4. Layers of Blocking or Plates:
 - a. Stagger end joints between upper and lower pieces.
 - b. Nail at ends and not over 610 mm (24 inches) between ends.
 - c. Stagger nails from side to side of wood member over 127 mm (5 inches) in width.

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**SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Roof tear-off, temporary roofing membrane, roof re-cover preparation, removal of base flashings on existing construction in preparation to receive new roofing membrane.
- B. Existing Membrane Roofing System: 60 mil EPDM roofing membrane, with related insulation, surfacing, and components and accessories between deck and roofing membrane.

1.2 RELATED WORK

- A. Use of the premises and phasing requirements: Section 01 00 00 GENERAL REQUIREMENTS.
- B. Temporary construction and environmental-protection measures for reroofing preparation: Section 01 00 00 GENERAL REQUIREMENTS
- C. Application of Restoration waterproofing coating on fully adhered EPDM membrane roof Section 07 56 00 FLUID-APPLIED ROOFING
- C. HVAC equipment removal and reinstallation: Division 23 sections.
- D. Electrical equipment disconnection and reconnection: Division 26 sections.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
 - ANSI/SPRI FX-1-01(R2006) Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C728-05.....Perlite Thermal Insulation Board
 - C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing

C1278/C1278M-07.....Standard Specification for Fiber-Reinforced
Gypsum Panel

D1079-09.....Standard Terminology Relating to Roofing and
Waterproofing

D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.

4450-89.....Approved Standard for Class 1 Insulated Steel
Deck Roofs

4470-10.....Approved Standard for Class 1 Roof Coverings

1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.

1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof
Components

1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing

E. National Roofing Contractors Association: Roofing and Waterproofing
Manual

1.4 MATERIALS OWNERSHIP

- A. Assume ownership of demolished materials and remove from Project site and dispose of legally, unless indicated to be reused, reinstalled, or otherwise to remain VA's property.

1.5 DEFINITIONS

- A. Refer to ASTM D1079 and NRCA "The NRCA Roofing and Waterproofing Manual" for definition of terms.

1.6 QUALITY CONTROL

- A. Requirements of Division 07 roofing section for qualifications of roofing system and roofing insulation Installer; work of this section shall be performed by same Installer.
1. Where Project requirements include work affecting existing roofing system to remain under warranty, Installer must be approved by warrantor of existing roofing system. Coordinate extents of existing roof warranty with COR.
- B. Regulatory Requirements: Comply with governing EPA notification regulations. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Reroofing Conference: Conduct conference at Project site.
1. Meet with VA - COR; Architect-Engineer; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer including project manager, superintendent, and

- foreman; and installers whose work interfaces with or affects reroofing.
2. Review methods and procedures related to roofing system tear-off and replacement
- D. Roofing Restoration Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to roofing system:
1. Meet with Owner; roofing coating materials manufacturer's representative; roofing Installer including project manager and foreman; and installers whose work interfaces with or affects Restoration including installers of roof accessories and roof-mounted equipment requiring removal and replacement as part of the Work.
 2. Methods and procedures related to coating preparation, including membrane roofing system manufacturer's written instructions.
 3. Roof drainage during each stage of coating and review roof drain plugging and plug removal procedures.
 4. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that will affect coating.
 5. HVAC shutdown and sealing of air intakes.
 6. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
 7. Review existing conditions that may require notification of COR before proceeding.
- E. Installer Qualifications: Workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years experience installing products comparable to those specified, and the following:
1. Qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

1.7 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

- B. Manufacturer's Literature and Data:
 - 1. Recover boards.
 - 2. Restoration waterproofing coating
- C. List of proposed infill materials.
- D. List of proposed temporary roofing materials.
- E. Fastener pull-out test report and adhesives test report.
- F. Photographs or Videotape: Document existing conditions of adjacent construction including site improvements.
- G. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a licensed landfill facility.
- H. Qualification Data: For Installer.
 - 1. Certificate indicating Installer is licensed to perform asbestos abatement.
 - 2. Certificate indicating Installer is approved by each warrantor of existing roofing system identified by the COR.
- I. Warranties: Unexecuted sample copies of special warranties.
- J. Closeout submittals
 - 1. Maintenance Data: To include in maintenance manuals.
 - 2. Warranties: Executed copies of approved warranty forms.

1.8 PROJECT CONDITIONS

- A. VA-COR will occupy portions of building below reroofing area. Conduct reroofing so VA - COR's operations will not be disrupted.
 - 1. Coordinate work activities daily with VA - COR.
 - 2. Provide VA - COR with not less than 72 hours' notice of activities that may affect VA - COR's operations.
- B. Protect building and landscaping from damage.
- C. Maintain access to existing walkways, Emergency Ambulance Access and adjacent occupied facilities.
- D. Available Information: The following are available for Contractor reference:
 - 1. Roof Moisture Survey of existing membrane roofing system.
 - 2. Report on test cores from existing membrane roofing system.
 - 3. Construction Drawings and Project Manual for existing roofing system.
 - 4. Contractor is responsible for interpretation and conclusions based upon available information.

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

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces affected by reroofing, by methods and with materials acceptable to warrantor.
1. Notify warrantor of existing roofing system before proceeding, and upon completion of reroofing.
 2. Obtain documentation verifying that existing roofing system has been inspected by warrantor and what portions of the roof warranty remains in effect.
- B. Submit new warranty documentation at Project closeout.
- C. Special Warranty for Roof Restoration: Written warranty in which Manufacturer agrees to repair roof coating installations that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Membrane failures including rupturing, cracking, or puncturing.
 - b. Deterioration of membranes, coatings, metals, metal finishes, and other associated materials beyond normal weathering.
 2. Annual Manufacturer Inspection and Preventive Maintenance Requirement: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's annual inspections and preventive maintenance is included in the Contract Sum. Inspections to occur in Year 2, 5, 10, and 15 following completion.
 3. Warranty Period: 10 years from date of completion of Restoration work.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS

- A. Use infill materials matching existing membrane roofing system materials.

2.2 TEMPORARY ROOFING MATERIALS

- A. Design of temporary roofing and selection of materials are responsibilities of Contractor.

2.3 RECOVER BOARDS

- A. Insulation Serving as Recover Board: Requirements are specified in Section 07 22 00 ROOF AND DECK INSULATION.
- G. Fasteners: Factory-coated steel fasteners, No. 12 or 14, and metal or plastic plates listed in FM Approval's "RoofNav."

2.4 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer and compatible with components of existing and new membrane roofing system.
- B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "RoofNav."
- C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.
- D. Drains: Provide new metal strainers, overflow rings, and clamping rings with new roof system, or where drains are damaged.
- E. Seam Reinforcing Mesh: Polyester mesh recommended and approved for use with membrane coating.
- F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect existing membrane roofing system that is indicated not to be reroofed.
 - 1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
 - 2. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
- B. Coordinate with COR to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

1. Comply with COR's requirements for maintaining fire watch when temporarily disabling smoke detectors.
- C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, and when rain is forecast.
 1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding.
 2. Do not permit water to enter into or under existing membrane roofing system components that are to remain.
- E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. General: Notify COR each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a power broom.
- C. Remove pavers and accessories from roofing membrane. Store and protect pavers and accessories for reuse. Discard cracked pavers.
- D. Remove protection mat and insulation from protected roofing membrane.
 1. Discard insulation that is wet and exceeds 128 kg/cu. m (8 lb/cu. ft.).
- E. Roof Tear-Off: Remove existing roofing membrane and other membrane roofing system components down to the deck.
Remove cover boards.
 3. Remove fasteners from deck.

3.3 DECK PREPARATION

- A. Inspect deck after tear-off of membrane roofing system.
- B. Verify that concrete substrate is visibly dry and free of moisture.
Test for capillary moisture by plastic sheet method according to ASTM D

4263. Do not proceed with roofing work if moisture condenses under the plastic sheet.

- C. 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 Architect-Engineer. Do not proceed with installation until directed by Architect-Engineer.
- D. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect-Engineer. Do not proceed with installation until directed by Architect-Engineer.
- E. Provide additional deck securement as indicated on Drawings.
- F. Replace deck as indicated on Drawings.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in the tear-off areas to match existing membrane roofing system construction.
 - 1. Installation of infill materials is specified in Section 07 53 23 Ethylene-Propylene-Diene-Monomer Roofing.
 - 2. Install new roofing membrane patch over roof infill area. If new roofing membrane is installed the same day tear-off is made, roofing membrane patch is not required.

3.5 ROOF RE-COVER PREPARATION

Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing membrane that inhibit new recover boards, primers, adhesives or coatings from conforming to substrate.

- 1. Broom clean existing substrate.
- 2. Coordinate with VA - COR's inspector to schedule times for tests and inspections before proceeding with installation of recover boards.
- 3. Remove materials that are wet or damp.
- 4. Before a coating is applied, clean substrate of contaminants such as dirt, debris, oil, and grease that can affect adhesion of coating by power washing at minimum 2000 psi. Remove existing coatings if any. Allow to dry thoroughly.

5. After cleaning and washing, verify that existing substrate is dry before proceeding with application of coating. Spot check substrates with an electrical capacitance moisture-detection meter.
- B. Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing membrane that inhibit new roofing membrane from conforming to substrate.
2. Broom clean existing substrate.
3. Coordinate with VA - COR's inspector to schedule times for tests and inspections.
4. Remove materials that are wet and damp. Removal will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents.
5. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing with a power broom.
6. Power vacuum the existing roof surface. If recommended by manufacturer, prime dried surface at recommended rate with recommended primer.

3.6 EXISTING BASE FLASHINGS

- A. Remove existing base flashings around parapets, curbs, walls, and penetrations.
 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.

3.7 FASTENER PULL-OUT TESTING

- A. Retain independent testing and inspecting agency to conduct fastener pull-out tests according to SPRI FX-1, and submit test report to Architect-Engineer before installing new membrane roofing system.
 1. Obtain Architect-Engineer's approval to proceed with specified fastening pattern. Architect-Engineer may furnish revised fastening pattern commensurate with pull-out test results.

3.8 RECOVER BOARD INSTALLATION

- A. Install recover boards over roofing membrane with long joints in continuous straight lines and end joints staggered between rows. Loosely butt recover boards together and fasten to deck.

1. Fasten recover boards to resist wind-uplift pressure at corners, perimeter, and field of roof specified in Section 07 53 23 Ethylene-Propylene-Diene-Monomer Roofing.
2. Install additional fasteners near board corners and edges as necessary to conform boards to substrate and to adjacent boards.

3.9 DRAIN INSTALLATION

- A. Where indicated, remove EPDM membrane at drain sumps and replace with new EPDM membrane. Tie-in new membrane to existing membrane.
- B. Remove drain ring and overflow ring and replace with new metal rings and metal strainers.
- C. Replace and seal all drains.

3.10 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove coating that does not comply with requirements, repair substrates, and reapply coating.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.11 DISPOSAL

- A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
 1. Storage or sale of demolished items or materials on-site is not permitted.
- B. Transport and legally dispose of demolished materials off VA - COR's property.

END OF SECTION

**SECTION 07 22 00
ROOF AND DECK INSULATION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Roof and deck insulation, vapor retarder, on new construction ready to receive roofing or waterproofing membrane.
- B. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- C. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 90.1-07.....Energy Standard for Buildings Except Low-Rise Residential Buildings
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C552-07.....Cellular Glass Thermal Insulation
 - C726-05.....Mineral Fiber Roof Insulation Board
 - C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - C1278/C1278M-07.....Standard Specification for Fiber-Reinforced Gypsum Panel

- C1289-10.....Faced Rigid Cellular Polyisocyanurate Thermal
Insulation Board
- D1970-09.....Standard Specification for Self-Adhering
Polymer Modified Bituminous Sheet Materials
Used as Steep Roofing Underlayment for Ice Dam
Protection
- D2822-05.....Asphalt Roof Cement
- D4586-07.....Standard Specification for Asphalt Roof Cement,
Asbestos-Free
- E84-09.....Standard Test Method for Surface Burning
Characteristics of Building Material
- F1667-05.....Driven Fasteners: Nails, Spikes, and Staples
- D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
4470-10.....Approved Standard for Class 1 Roof Coverings
1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof
Components
1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- E. National Roofing Contractors Association: Roofing and Waterproofing
Manual
- F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog,
www.biopreferred.gov
- G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)
- H. U.S. Department of Commerce National Institute of Standards and
Technology (NIST):
DOC PS 1-09.....U.S. Product Standard for Construction and
Industrial Plywood
DOC PS 2-04.....Performance Standard for Wood-Based Structural-
Use Panels.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Provide roof insulation meeting minimum overall
average R-value of 33, with minimum R-value at any location of 20 .
- B. FM Approvals: Provide roof insulation complying with requirements in
FM Approvals 4450 and 4470 as part of specified roofing system, listed
in FM Approvals "RoofNav" as part of roofing system meeting
Fire/Windstorm Classification in Division 07 roofing section.

1.5 QUALITY CONTROL

- A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.
- B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.
- C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.
- D. Requirements of applicable FM Approval for specified roofing system insulation attachment.
- E. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
 - 1. Asphalt and adhesive materials, each type.
 - 2. Roofing cement, each type.
 - 3. Roof insulation, each type.
 - 4. Fastening requirements.
 - 5. Insulation span data for flutes of metal decks.
- C. and Federal Sustainable Design Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
 - 2. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
 - 1. Nailers, cants, and terminations.

2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:

1. Roof insulation, each type.
2. Nails and fasteners, each type.

F. Certificates:

1. Indicating type, thermal conductance, and minimum and average thickness of insulation.
2. Indicating materials and method of application of insulation system meet the requirements of FM Approvals for specified roofing system.

G. Laboratory Test Reports: Thermal values of insulation products.

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications.

1.7 QUALITY ASSURANCE:

A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.

1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."
3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS

2.1 ADHESIVE MATERIALS

A. Adhesive Materials, General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.

1. Liquid-type adhesive materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Multipurpose Construction Adhesives: 70 g/L.
 - c. Fiberglass Adhesives: 80 g/L.
 - d. Contact Adhesives: 80 g/L.
 - e. Other Adhesives: 250 g/L.
 - f. Nonmembrane Roof Sealants: 300 g/L.
 - g. Sealant Primers for Nonporous Substrates: 250 g/L.
 - h. Sealant Primers for Porous Substrates: 775 g/L.
- B. Primer: ASTM D41.
- C. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.
- D. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- E. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- F. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- G. Roof Cement: Asbestos free, ASTM D2822, Type I or Type II, ; or, D4586, Type I or Type II.

2.2 ROOF AND DECK INSULATION

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Roof Insulation System:

1. Fabricate of polyisocyanurate. Use only one insulation material for tapered sections. Use only factory-tapered insulation.
 2. Cut to provide high and low points with crickets and slopes as shown.
 3. Minimum thickness of tapered sections; 38 mm (2 inch).
 4. Minimum slope 1:48 (1/8 inch per 12 inches).
- D. Composite Nail Base Insulated Roof Sheathing:
1. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: polyisocyanurate thermal insulation ASTM C1289, Type V, insulation thickness as indicated, with oriented strand board laminated to top surface.
 2. Oriented Strand Board: NBS DOC PS 1, Exposure 1, 15.9 mm (5/8 inch) thick.
 3. Bottom surface faced with felt facers.

2.3 INSULATION ACCESSORIES

- A. Glass (Felt): ASTM D2178, Type VI, heavy duty ply sheet.
- B. Cants and Tapered Edge Strips:
1. Wood Cant Strips: Refer to Division 06 Section "Rough Carpentry."
 2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
 3. Tapered Edge Strips: 1:12 (one inch per foot), from 0 mm (0 inches), 300 mm to 450 mm (12 inches to 18 inches) wide.
 - a. Cellulosic Fiberboard: ASTM C208.
 - b. Mineral Fiberboard: ASTM C726.
 - c. Perlite Board: ASTM C728.
- C. Vapor Retarder:
1. Glass-Fiber Felts: ASTM D2178, Type IV, asphalt impregnated.
 2. Self-Adhering Sheet Vapor Retarder: ASTM D1970, minimum of 1.0-mm- (40-mil-) thick, polyethylene film laminated to layer of rubberized asphalt adhesive, or 0.76- to 1.0-mm- (30- to 40-mil-) thick, polyethylene film laminated to layer of butyl rubber adhesive; maximum permeance rating of 6 ng/Pa x s x sq. m (0.1 perm).
- D. Cover Board:
1. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, mm (1/2 inch) thick, factory primed.

2. Oriented Strand Board, DOC PS 2, Exposure 1, 11 mm (7/16 inch) thick.

2.4 FASTENERS

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.
- B. Staples and Nails: ASTM F1667. Type as designated for item anchored and for substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

- A. Comply with requirements of Division 07 roofing section.

3.3 VAPOR RETARDER INSTALLATION

- A. General:
 1. Install continuous vapor retarder on roof decks where indicated.
 2. At vertical surfaces, turn up vapor retarder to top of insulation or base flashing.
 3. At all pipes, walls, and similar penetrations through vapor retarder, seal openings with roof cement to prevent moisture entry from below.
 4. Seal penetrations with roof cement.
- B. Cast in Place Concrete Decks, Except Insulating Concrete:
 1. Prime deck as specified.
 2. Apply two plies of asphalt saturated felt mopped down to deck.

3.5 RIGID INSULATION INSTALLATION

- A. Insulation Installation, General:
 1. Install roof insulation in accordance with roofing system manufacturer's written instructions.
 2. Install roof insulation in accordance with requirements of FM Approval's Listing for specified roofing system.
 3. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate prior to installation of insulation.

4. Cant Strips: Install wood cant strips specified in Division 06 Section ROUGH CARPENTRY at junctures of roofing system with vertical construction.
 5. Use same insulation as existing for roof repair and alterations unless specified otherwise. Notify Architect of Discrepancies between existing roof and indicated or specified insulations.
- B. Insulation Thickness:
1. Thickness of roof insulation shown on drawings is nominal. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
 2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.
 3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
 4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 52 mm (2 inches).
 5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).
- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tight against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
1. Adhered Insulation:

- a. Prime substrate as required.
 - b. Set each layer of insulation firmly in solid mopping of hot asphalt.
 - c. Set each layer of insulation firmly in ribbons of bead-applied insulation adhesive.
 - d. Set each layer of insulation firmly in uniform application of full-spread insulation adhesive.
4. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Adhered Insulation" requirements.

- - - E N D - - -

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS, VAPOR PERMEABLE

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies fluid-applied vapor-permeable membrane air barrier material and accessories used for exterior above grade wall assembly air barriers, drainage planes, and their extension and connection to existing air barrier components in walls, roof and opening construction to provide a durable, continuous, air- and moisture- impermeable solution to modified veneer masonry walls.

1.2 RELATED WORK

- A. Masonry units serving as substrate for membrane air barriers, including preparation of surface: Section 04 20 00 UNIT MASONRY.
- B. Flashing components of factory finished roofing and wall systems to which membrane air barriers will transition: Division 07 roofing and wall system sections.
- C. Other flashing components to which membrane air barriers will transition: Section 07 60 00 FLASHING AND SHEET METAL.
- D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
 - 1. Air Barrier Association of America (ABAA):Quality Assurance Program
 - 2. American Society of Testing and Materials (ASTM):
 - C920-10.....Standard Specification for Elastomeric Joint Sealants
 - C1193-09.....Standard Guide for Use of Joint Sealants
 - D412-06.....Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - D2369-10.....Standard Test Method for Volatile Content of Coatings

- E96/E96M-05.....Standard Test Methods for Water Vapor
Transmission of Materials
- E162-09.....Standard Test Method for Surface Flammability
of Materials Using a Radiant Heat Energy Source
- E783-02.....Standard Test Method for Field Measurement of
Air Leakage Through Installed Exterior Windows
and Doors
- E1186-03(2009).....Standard Practices for Air Leakage Site
Detection in Building Envelopes and Air Barrier
Systems
- E2178-03.....Standard Test Method for Air Permeance of
Building Materials
- E2357-05.....Standard Test Method for Determining Air
Leakage of Air Barrier Assemblies
- 3. U.S. Environmental Protection Agency (EPA)
40 CFR 59, Subpart D....National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products
- 4. SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT (SCAQMD):
1168-89(2003).....Adhesive and Sealant Applications

1.4 PERFORMANCE REQUIREMENTS

- A. General: Membrane air barrier shall be capable of performing as a continuous vapor- permeable air barrier and as a moisture drainage plane transitioned to adjacent flashings and discharging water to the building exterior. Membrane air barriers shall accommodate substrate movement and seal expansion and control joints, construction material transitions, opening transitions, penetrations, and perimeter conditions without moisture deterioration and air leakage exceeding performance requirements.
- B. Material Compatibility: Provide membrane air barrier materials that are compatible with one another and with adjacent materials under conditions of service and application required, as demonstrated by membrane air barrier manufacturer based on testing and field experience.

1.5 QUALIFICATIONS:

- A. Approvals: Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:
- B. Manufacturer Qualifications: Manufacturer regularly and presently manufactures fluid-applied membrane air barrier material meeting section requirements as one of its principal products.
 - 1. Manufacturer's product submitted has been in satisfactory and efficient operation on five similar installations for at least five years.
 - a. Submit list of installations, include name and location of project and name of VA - COR.
 - 2. Accreditation: Manufacturer is accredited by the Air Barrier Association of America.
- C. Installer Qualifications: Installer has technical qualifications, experience, certifications, trained personnel, membrane air barrier manufacturer's approval, and facilities to install specified items.
 - 1. Accreditation: Installer shall be accredited by the Air Barrier Association of America (ABAA) and whose installers are certified in accordance with the site Quality Assurance Program used by ABAA.
 - 2. Installer's applicators shall be trained and certified by manufacturer of air barrier system.
 - 3. Installer's full time on-site field supervisor shall have completed three projects of similar scope within last year, be able to communicate verbally with Contractor, Architect, testing agency, and employees.
 - a. Certification: Installer's supervisor shall hold Sealant, Waterproofing, and Restoration Institute (SWRI) Wall Coating Validation Program Certificate, or similar qualification acceptable to COR.

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Fluid-applied membrane air barrier.
 - 2. Primer.

3. Mastic.
4. Counterflashing strip.
5. Sprayed polyurethane foam sealant.
6. Joint sealant.

C. Certificates:

1. Indicating membrane air barrier manufacturer's qualifications as specified.
2. Indicating approval of installer by membrane air barrier manufacturer.
3. Indicating qualifications of installer and installer's personnel.
4. Indicating air barrier manufacturer's determination that proposed materials are chemically and adhesively compatible with adjacent materials.

- D. Inspection Reports: Daily reports of testing agency and reports of testing and inspection agency. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.7 COORDINATION:

- A. Coordinate installation of work of this Section with adjacent and related work to ensure provision of continuous, unbroken, durable air barrier system.

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING:

- A. Deliver materials to job in manufacturer's original unopened containers.
- B. Do not store material in areas where temperature is lower than 10 degrees C (50 degrees F,) or where prolonged temperature is above 32 degrees C (90 degrees F).

1.9 ENVIRONMENTAL REQUIREMENTS:

Ambient Surface and Material Conditions: Not less than 4 degrees C (40 degrees F), during application of waterproofing, visibly dry, and complying with manufacturer's written instructions.

1.10 WARRANTY:

Warrant membrane air barrier installation against air and moisture leaks subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is two years.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain membrane air barrier materials and accessories from single manufacturer.
- B. VOC Content: Maximum 250 g/L per 40 CFR 59, Subpart D (EPA Method 24).

2.2 MEMBRANE AIR BARRIER:

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, or synthetic polymer membrane, meeting the following:
 - 1. Air Permeance, ASTM E 2178: 0.02 L/s x sq. m of surface area at 75-Pa (0.004 cfm/sq. ft of surface area at 1.57-lbf/sq. ft.) pressure difference.
 - 2. Vapor Permeance, ASTM E 96/E96M: Minimum 580 ng/Pa x s x sq. m (10 perms).
 - 3. Elongation, Ultimate, ASTM D 412, Die C: 200 percent, minimum.
 - 4. Combustion Characteristics: Flame spread, not greater than 25; smoke developed, not greater than 450, ASTM E 84.
 - 5. Thickness of Membrane Air Barrier: Not less than 1.0 mm (40 mils), applied in single continuous coat.

2.3 ACCESSORY MATERIALS:

- A. Primer: Liquid waterborne primer meeting VOC requirements, recommended for substrate by membrane air barrier manufacturer.
- B. Substrate Patching Material: Manufacturer's standard trowel-grade filler material.
- C. Sprayed Polyurethane Foam Sealant: Foamed-in-place, 24- to 32-kg/cu. m (1.5- to 2.0-lb/cu. ft) density, with flame-spread index of 25 or less per ASTM E 162.
- D. Flexible Opening Transition: Cured low-modulus silicone extrusion with reinforcing ribs, sized to fit opening widths, designed for adhesion to or insertion into aluminum framing extrusions, and compatible with air barrier system materials and accessories.
- E. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, approved by membrane air barrier manufacturer for adhesion and compatibility with membrane air barrier and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Surface Condition: Before applying membrane air barrier materials, ensure substrates are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion.
- B. Verify masonry joints are flush and filled with mortar.

3.2 INTERFACE WITH OTHER WORK

- A. Commencement of Work: Commence work once cavity wall and veneer brick have been removed, through wall (thru-wall) flashing is installed and sealed, and the area prepared for air barrier and roof work.
- B. Sequencing of Work: Coordinate sequencing of work with roof work to ensure that flashings and transition materials can be properly installed.
- C. Subsequent Work: Coordinate work with work of other sections installed subsequent to membrane air barrier to ensure complete inspection of installed membrane air barrier and sealing of membrane air barrier penetrations necessitated by subsequent work.

3.3 AIR BARRIER INSTALLATION

- A. General: Prepare substrates and install and apply air barrier components in accordance with air barrier manufacturer's written instructions consistent with manufacturer's qualifying tested assemblies.

3.4 PREPARATION

- A. Prepare and treat substrate in accordance with membrane air barrier manufacturer's written instructions.
- B. Mask adjacent finished surfaces and existing finished surfaces.
- C. Remove contaminants and film-forming coatings from concrete.
- D. Remove projections and excess materials and fill voids with substrate patching material.
- E. Prepare and treat joints and cracks in substrate per ASTM C 1193 and membrane air barrier manufacturer's written instructions.
- F. Apply primer to substrates.

3.5 APPLICATION OF TRANSITION STRIPS

- A. Install transition strips and accessory materials according to membrane air barrier manufacturer's written instructions.

- B. Connect and seal membrane air barrier material to adjacent components of building air barrier system, including, but not limited to, roofing system air barrier through wall (thru-wall) flashing, and other openings.
- C. Flexible Opening Transition: Prime concealed perimeter frame surfaces of windows, storefronts, curtain walls, louvers, and doors. Apply flexible opening transition so that a minimum of 75 mm (3 inches) over coverage is achieved over each substrate.
 - 1. Fill gaps at perimeter of openings with foam sealant.
- D. Penetrations: Fill gaps at perimeter of penetrations with foam sealant. Seal transition strips around penetrating objects with termination mastic.
- E. Flashings: Seal top of through-wall flashings to membrane air barrier with continuous transitions strip of type recommended by membrane air barrier manufacturer for type of flashing.

3.6 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. Apply fluid membrane air barrier material in full contact with substrate to produce a continuous seal with transition strips according to membrane air barrier manufacturers written instructions.
 - 1. Apply fluid membrane in thickness recommended by manufacturer, but not less than thickness specified in this section.
- B. Correct deficient applications not passing tests and inspections, make necessary repairs, and retest as required to demonstrate compliance with requirements.

3.7 INSPECTIONS:

- B. Inspections shall include:
 - 1. Compatibility of materials within membrane air barrier system and with adjacent materials.
 - 2. Suitability of substrate and support for membrane air barrier materials.
 - 3. Suitability of conditions under which membrane air barrier will be applied.
 - 4. Adequacy of substrate priming.
 - 5. Proper application and joint and edge treatment of transition strips, flexible opening transitions, and accessory materials.

6. Continuity and gap-free installation of membrane air barrier,
transition strips, and accessory materials.

3.8 CLEANING AND PROTECTION

- A. Clean spills, stains, and overspray resulting application utilizing
cleaning agents recommended by manufacturers of affected construction.
Remove masking materials.
- B. Protect membrane air barrier from damage from subsequent work. Protect
membrane materials from exposure to UV light in excess of that
acceptable to membrane air barrier manufacturer; replace overexposed
materials and retest.

- - - E N D - - -

SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING

PART 1 GENERAL

1.1 DESCRIPTION

- A. Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to roof deck.
- B. Fire rated roof system.

1.2 RELATED WORK

- A. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY.
- B. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- C. Metal cap flashings, copings, fascias, and expansion joints: Section 07 60 00, FLASHING AND SHEET METAL.
- D. Equipment supports : Section 07 72 00, ROOF ACCESORIES.

1.3 QUALITY ASSURANCE

- A. Approved applicator by the membrane roofing system manufacturer, and certified by the manufacturer as having the necessary expertise to install the specific system.
- B. Pre-Roofing Meeting:
 - 1. Prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and COR,
 - 2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 - 3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
 - c. Examine samples and installation instructions of manufacturer.
 - d. Perform pull out test of fasteners (See paragraph 3.2).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Applicators approval certification by manufacturer.
- C. Shop Drawings:
 - 1. Sheet membrane layout.
 - 2. Fastener pattern, layout, and spacing requirements.
 - 3. Termination details.
- D. Manufacturers installation instructions revised for project.
- E. Samples:
 - 1. Sheet membrane: One 150 mm (6 inch) square piece.
 - 2. Sheet flashing: One 150 mm (6 inch) square piece.
 - 3. Fasteners: Two, each type.
 - 4. Welded seam: Two 300 mm (12 inch) square samples of welded seams to represent quality of field welded seams.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, and handle materials as specified by manufacturer.
- B. Store volatile materials separate from other materials with separation to prevent fire from damaging the work, or other materials.

1.6 WARRANTY

Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to ten (10) years.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A167-99(R2009).....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - B209-07.....Aluminum and Aluminum-Alloy Sheet and Plate
 - D751-06.....Coated Fabrics
 - D2103-10.....Polyethylene Film and Sheeting
 - D2240-05(R2010).....Rubber Property - Durometer Hardness
 - D3884-09.....Abrasive Resistance of Textile Fabrics (Rotary Platform, Double-Head Method)
 - D4637-10.....EPDM Sheet Used in Single-Ply Roof Membrane
 - D4586-07.....Asphalt Roof Cement, Asbestos Free
 - E96-10.....Water Vapor Transmission of Materials

E108-10.....Fire Tests of Roof Coverings
 G21-09.....Resistance of Synthetic Polymeric Materials to
 Fungi

- C. National Roofing Contractors Association (NRCA):
 Fifth Edition - 05.....The NRCA Roofing and Waterproofing Manual.
- D. Federal Specifications (Fed. Spec.)
 FF-S-107C(2).....Screws, Tapping and Drive
 FF-S-111D(1).....Screw, Wood
 UU-B-790A.....Building Paper, Vegetable Fiber (Kraft,
 Waterproofed, Water Repellent and Fire
 Resistant)
- E. Factory Mutual Engineering and Research Corporation (FM):
 Annual Issue.....Approval Guide Building Materials
- F. Underwriters Laboratories, Inc (UL):
 Annual Issue.....Building Materials Directory
 Annual Issue.....Fire Resistance Directory
- G. Warnock Hersey (WH):
 Annual Issue.....Certification Listings

PART 2 - PRODUCTS

2.1 EPDM SHEET ROOFING

- A. Conform to ASTM D4637, Type I, Grade 1, white color.
- B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer
Water Vapor Permeance	ASTM E96	Minimum 0.14 perms Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.
Fire Resistance	ASTM E108 Class A	No Combustion Beyond Flame/Heat Source

- C. Thickness:
 1. Use 1.14 mm (0.045-inch) thick sheet for adhered system .
- D. Pipe Boots:
 1. Molded EDPM designed for flashing of round penetrations, 200 mm (8
 inch) minimum height.
 2. Color same as roof membrane.

2.2 EPDM FLASHING SHEET

- A. Conform to ASTM D4637, Type I, Grade 1, Class U, unreinforced, color, same as roof membrane modified as specified for flashing.
- B. Self curing EPDM flashing, adaptable to irregular shapes and surfaces.
- C. Minimum thickness 1.5 mm (0.060-inch).

2.3 MISCELLANEOUS ROOFING MEMBRANE MATERIALS

- A. Sheet roofing manufacturers specified products.
- B. Splice Adhesive: For roofing and flashing sheet.
- C. Lap Sealant: Liquid EPDM rubber for roofing sheet exposed lap edge.
- D. Bonding Adhesives: Neoprene, compatible with roofing membrane, flashing membrane, insulation, metals, concrete, and masonry for bonding roofing and flashing sheet to substrate.
- E. Fastener Sealer: One part elastomeric adhesive sealant.
- F. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.
- G. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.
- H. Asphalt Roof Cement: ASTM D4586.

2.4 FASTENERS

- A. Fasteners and washers required for securing sheet roofing to deck:
 - 1. Concrete and Masonry Wall Surfaces:
 - a. Nail penetration 13 mm (1/2 inch).
 - 2. Wood:
 - a. Screws; Fed. Spec. FF-S-111, Type I, Style 2.5, coated to resist corrosion, length to provide 19 mm (3/4 inch) minimum penetration.
 - b. Nails: Barbed shank, galvanized.
 - 3. Washers: Neoprene backed metal washer 28 mm (1-1/8 inch) minimum diameter.
 - 4. To Sheet Metal: Self tapping screw; Fed. Spec. FF-S-107, 2 mm (No. 14), sheet metal screw, minimum thread penetration of 6 mm (1/4 inch); stainless steel.
- B. Pipe Compression Clamp or Drawband:
 - 1. Stainless steel or cadmium plated steel drawband.
 - 2. Worm drive clamp device.
- C. Surface mounted base flashing clamp strip:
 - 1. Stainless steel strip, ASTM A167, type 302 or 304, dead soft temper, minimum 0.5 mm (0.018-inch) thick.
 - 2. Aluminum strip: ASTM B209 24 mm (.094-inch) thick.
 - 3. For exposed location, form strips with 6 mm (1/4 inch) wide top edge bent out 45 degrees (for sealant) from 40 mm (1-1/2 inch) wide

- material; 2400 mm (8 feet) maximum length with slotted 6 mm x 10 mm (1/4 by 3/8-inch) holes punched at 200 mm (8 inch) centers, centered between bend and bottom edges.
4. For locations covered by cap flashings, form strips 30 mm (1-1/4 inch) wide, 2400 mm (8 feet) maximum length with slotted holes 6 mm x 10 mm (1/4 by 3/8 inch) punched at 200 mm (8 inch) centers, centered on strip width.
- D. Fasteners and washers required for securing pavers together with straps and to walls or other anchorage.
1. Straps for securing pavers together:
- a. Stainless steel strap: ASTM A167, type 302 or 304, minimum 0.46 mm (0.018 inch) thick.
 - b. Aluminum strap: ASTM B209, minimum 2.39 mm (0.094 inch) thick.
 - c. Rounded corners on straps.
 - d. Form straps 38 mm (1-1/2 inches) wide, 3 m (10 feet) maximum length with 6 by 10 mm (1/4 by 3/8 inch) punched slotted holes at 100 mm (4 inch centers centered on width of strap. Punch hole size 2 mm (1/16 inch) larger than fastener shank when shank is thicker than 5 mm (3/16 inch).

2.5 VAPOR RETARDER OR SEPARATION SHEETS

- A. Polyethylene film: ASTM D2103, 0.2 mm (6 mils) thick.
- B. Building Paper: Fed. Spec. UU-B-790.
1. Water vapor resistance: Type I, Grade A, Style 4, reinforced.
 2. Water vapor permeable: Type I, Grade D, Style 4, reinforced.

2.6 FLEXIBLE TUBING

- A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.
- B. Diameter approximately 1-1/2 times joint width.

2.7 WALKWAY PADS

- A. Rubber walkway pad approximately 450 mm x 450 mm (30 by 30 inches) square or manufacturers standard size with rounded corners.
- B. Approximately 13 mm (1/2 inch) thick.
- C. Ultraviolet light stabilized.

2.8 PROTECTION MAT OR SEPARATION SHEETS

- A. Protection Mat:
1. Water pervious; either woven or non-woven pervious sheet of long chain polymeric filaments or yarns such as polypropylene, black polyethylene, polyester, or polyamide; or, polyvinylidene-chloride formed into a pattern with distinct and measurable openings.

2. Filter fabric equivalent opening size (EOS): Not finer than the U.S.A. Standard Sieve Number 120 and not coarser than the U.S.A. Standard Sieve Number 100. EOS is defined as the number of the U.S.A. Standard Sieve having openings closest in size to the filter cloth openings.
3. Edges of fabric selvaged or otherwise finished to prevent raveling.
4. Abrasion resistance:
 - a. After being abraded in conformance with ASTM D3884 using rubber-hose abrasive wheels with one kg load per wheel and 1000 revolutions, perform tensile strength test as specified in ASTM D1682, paragraph.
 - b. Result; 25 kg (55 pounds) minimum in any principle direction.
5. Puncture strength:
 - a. ASTM D751 - tension testing machine with ring clamp; steel ball replaced with a 8 mm (5/16 inch) diameter solid steel cylinder with a hemispherical tip centered within the ring clamp.
 - b. Result; 57 kg (125 pounds) minimum.
6. Non-degrading under a wet or humid condition within minimum 4°C (40°F) to maximum 66°C (150°F) when exposed to ultraviolet light.
7. Minimum sheet width: 2400 mm (8 feet).

PART 3 - EXECUTION

3.1 GENERAL

- A. Do not apply if deck will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless protection provided to distribute loads less than one-half compression resistance of roofing system materials.
 1. Curbs, blocking, edge strips, and other components to which roofing and base flashing is attached in place ready to receive insulation and, roofing.
 2. Coordinate roof operation with sheet metal work and roof insulation work so that insulation and flashing are installed concurrently to permit continuous roofing operations.
 3. Complete installation of flashing, insulation, and roofing in the same day except for the area where temporary protection is required when work is stopped.
- B. Phased construction is not permitted. The complete installation of roofing system is required in the same day except for area where temporary protection is required when work is stopped. Complete installation includes pavers.

- C. Dry out surfaces that become wet from any cause during progress of the work before roofing work is resumed.
- D. Apply materials only to dry substrates.
- E. Except for temporary protection specified, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, fog, ice, or frost) is present in any amount in or on the materials.
 - 1. Do not apply materials to substrate having temperature of 4°C (40 degrees F) or less, or when materials applied with the roof require higher application temperature.
 - 2. Do not apply materials when the temperature is below 4°C (40 degrees F).
- F. Temporary Protection:
 - 1. Install temporary protection consisting of a temporary seal and water cut-offs at the end of each day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent.
 - 2. Temporarily seal exposed surfaces of insulation within the roofing membrane.
 - 3. Do not leave insulation surfaces or edges exposed.
 - 4. Use polyethylene film or building paper to separate roof sheet from bituminous materials.
 - 5. Apply the temporary seal and water cut off by extending the roof membrane beyond the insulation and securely embedding the edge of the roof membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant (night sealant) and weight edge with sandbags, to prevent displacement; space sandbags not over 2400 mm (8 foot) centers. Check daily to insure temporary seal remains watertight. Reseal open areas and weight down.
 - 6. Before the work resumes, cut off and discard portions of the roof membrane in contact with roof cement or bituminous materials.
 - a. Cut not less than 150 mm (6 inches) back from bituminous coated edges or surfaces.
 - b. Remove temporary polyethylene film or building paper.
 - 7. Remove and discard sandbags contaminated with bituminous products.
 - 8. For roof areas that are to remain intact and that are subject to foot traffic and damage, provide temporary wood walkways with notches in sleepers to permit free drainage.
 - 9. Provide 2 mm (6 mil) polyethylene sheeting or building paper cover over roofing membrane under temporary wood walkways and adjacent areas. Round all edges and corners of wood bearing on roof surface.

3.2 PREPARATION

- A. Remove dirt, debris, and surface moisture. Cover or fill voids greater than 6 mm (1/4 inch) wide to provide solid support for roof membrane.
- B. Install separation sheet over bituminous material on deck surface lapping edges and ends 150 mm (6 inches) or as recommended by roof membrane manufacturer.
 - 1. Do not install of separation sheet beyond what can be covered by roofing membrane each day.
 - 2. Use polyethylene, or building paper, that will be compatible with seaming method.
 - 3. Insure separation sheet completely isolates bituminous materials from EPDM roofing membrane.
 - 4. Turn up at penetrations, or other surfaces where bituminous materials occur, to cover bituminous product.
 - 5. Turn down over edges of blocking at perimeters to cover blocking.

3.3 INSTALLATION OF ROOFING AND FLASHING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with EPDM roofing membrane.
- B. If possible, install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. If possible, start at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet. Coordinate with roof insulation installation.
- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as sheet is being rolled out and remove defective areas:
 - 1. Allow 30 minutes for relaxing before proceeding.
 - 2. Lap edges and ends of sheets 75 mm (3 inches) or more as recommended by the manufacturer. Clean lap surfaces as specified by manufacturer.
 - 3. Adhesively splice laps. Apply pressure as required. Seam strength of laps as required by ASTM D4637.
 - 4. Check seams to ensure continuous adhesion and correct defects.
 - 5. Finish edges of laps with a continuous beveled bead of lap sealant to sheet edges to provide smooth transition as specified by manufacturer.
 - 6. Finish seams as the membrane is being installed (same day).
 - 7. Anchor perimeter to deck or wall as specified.

F. Membrane Perimeter Anchorage:

1. Install batten strip or steel stress plate with fasteners at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated in accordance with membrane manufacturer's instructions on top of roof membrane to wall or deck.

G. Adhered System:

1. Apply bonding adhesive in quantities required by roof membrane manufacturer.
2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of the deck with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's application instruction, roll the membrane into the adhesive in manner that minimizes voids and wrinkles.
4. Repeat for other half of sheet. Cut voids and wrinkles to lay flat and clean for repair patch over cut area.

H. Install flashings as the membrane is being installed (same day). If the flashing cannot be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

I. Flashing Roof Drains:

1. Install roof drain flashing as recommended by the membrane manufacturer, generally as follows:
 - a. Coordinate to set the metal drain flashing in asphalt roof cement, holding cement back from the edge of the metal flange.
 - b. Do not allow the roof cement to come in contact with the EPDM roof membrane.
 - c. Adhere the EPDM roof membrane to the metal flashing with the membrane manufacturer's recommended bonding adhesive.
2. Turn down the metal drain flashing and EPDM roof membrane into the drain body and install clamping ring and stainer.

J. Installing EPDM Base Flashing and Pipe Flashing:

1. Install EPDM flashing membranes to pipes, walls or curbs to a height not less than 200 mm (8 inches) above roof surfaces and 100 mm (4 inches) on roof membranes. Install in accordance with NRCA manual:
 - a. Adhere flashing to pipe, wall or curb with bonding adhesive.
 - b. Form inside and outside corners of EPDM flashing membrane in accordance with NRCA manual (Fifth Edition). Form pipe flashing in accordance with NRCA manual (Fifth Edition).

- c. Lap ends not less than 100 mm (4 inches).
 - d. Adhesively splice flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
2. Anchor top of flashing to walls or curbs with fasteners spaced not over 150 mm (6 inches) on center. Use surface mounted fastening strip with sealant on ducts. Use pipe clamps on pipes or other round penetrations.
 3. Apply sealant to top edge of flashing.
- K. Installing Building Expansion Joints:
1. Install base flashing on curbs as specified.
 2. Install flexible tubing 1-1/2 times width of joint over joint. Cover tubing with EPDM cover strip adhered to base flashing and lapping base flashing 100 mm (4 inches). Finish edges of laps with sealants as specified.
- O. Repairs to membrane and flashings:
1. Remove sections of EPDM sheet roofing or flashing that is creased wrinkled or fishmouthed.
 2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice to roof membrane or flashing. Finish edge of lap with sealant as specified.

3.4 WALKWAY PADS

- A. Clean membrane where pads are applied.
- B. Adhere pads to membrane with splicing cement.
- C. Allow not less than 1 inch break between pads and 2 inch maximum break.

3.5 FIELD QUALITY CONTROL

- A. Examine and probe seams in the membrane and flashing in the presence of the COR and Membrane Manufacturer's Inspector.
- B. Probe the edges of welded seams with a blunt tipped instrument. Use sufficient hand pressure to detect marginal bonds, voids, skips, and fishmouths.
- C. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through the seams where directed by the COR.
 1. Cut one sample for every 450 m (1500 linear feet) of seams.
 2. Cut the samples perpendicular to the longitudinal direction of the seams.

3. Failure of the samples to maintain the standard of quality within a reasonable tolerance of the approved samples will be cause for rejection of the work.
- D. Repair areas of welded seams where samples have been taken or marginal bond voids or skips occur.
- E. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

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SECTION 07 56 00
FLUID-APPLIED ROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

Application of Restoration waterproofing coating on fully adhered EPDM membrane roof.

1.2 RELATED WORK

- A. Roof re-cover preparation on existing construction in preparation to receive new roofing membrane: Section 07 01 50.19
PREPARATION FOR RE-ROOFING
- B. Color of weather course: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY CONTROL

- A. Work shall be performed by installer approved in writing by roofing material manufacturer.
- B. Installation shall comply with printed instructions of roofing materials manufacturer.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Certificates:
 - 1. Installer approval.
 - 2. Certificate stating that material utilized on the job will be of the same formulation as materials covered by the test report.
- C. Manufacturer's Literature and Data:
 - 1. Roofing system materials giving physical properties, wet mil thickness in relation to dry mil thickness, and other related information.
 - 2. Manufacturer's printed instructions for application of roofing materials to be installed.
- D. Certificate indicating Installer is approved by each warrantor of existing roofing system identified by the COR.
- E. Warranties: Unexecuted sample copies of special warranties.
- F. Test Reports: Test report meeting tests and requirements required by the Warranty.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's original factory sealed containers labeled to identify product, manufacturer and point of manufacture.
- B. Observe precautions appropriate to flammable materials and "safety notes" included in roofing material manufacturer's printed instructions to installer before, during, and immediately following application of these materials.

1.6 JOB CONDITIONS

- A. Work shall proceed only on dry surfaces free of water, surface condensation, rain, snow, ice, and frost.
- B. Do not proceed when temperature of surfaces to receive roofing and flashing, is lower than 5°C (40 degrees F).
- C. Complete work on roof deck and install penetrations and projections through roof deck before roofing and flashing work as this section is applied.

1.7 WARRANTY

Provide manufacturers standard roof recovery system warranty, subject to terms to "Warranty of Construction", FAR clause 52.246-21, except that warranty period is extended to five years.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM) Standards:
 - D412-06.....Vulcanized Rubber and Thermoplastic Elastomers-Tension
 - D750-06.....Rubber Deterioration in Carbon-Arc Weathering Apparatus
 - D1149-07.....Rubber Deterioration-Surface Ozone Cracking in a Chamber
 - E96-10.....Water Vapor Transmission of Materials

PART 2 - PRODUCTS

2.1 RESTORATION WATERPROOFING COATING

A. Polyurethane Fluid-Applied System: Fire resistant, two-coat, polyurethane, elastomeric coating system consisting of a single component, high-performance aromatic urethane base coat and a single component, high-performance aliphatic urethane finish coat, with the following properties.

1. Aromatic Urethane Base Coat: Single component, high solids, low VOC, low odor, moisture-cure, high performance system with the following properties:
 - a. VOC Content: less than 50 g/l
 - b. Elongation, ASTM D 412: 500-700%.
 - c. Tensile Strength, ASTM D 412: 220-260 psi.
2. Aliphatic Urethane Top Coat: Single component, fire resistant, aliphatic urethane finish coat with the following properties.
 - a. Elongation, ASTM D 412: 250%.
 - b. Tensile Strength, ASTM D 412: 3,480 psi.
 - c. Color: White.

2.2 MASTIC SEALANT:

Polyisobutylene, plain or modified bitumen, non-hardening, non-migrating, non-skinning, and nondrying.

2.3 SEAM REINFORCING MESH

- A. Polyester mesh recommended and approved for use with membrane coating.
- B. In lieu of SEAM REINFORCING MESH, provide manufacturers recommended mesh, tape or seam reinforcing product approved for warranty.

PART 3 - EXECUTION

3.1 EXAMINATION FOR RESTORATION

- A. Examine existing roofing substrates, with Installer present, for compliance with requirements and for other conditions affecting application and performance of roof coatings
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance.
 2. Verify compatibility with and suitability of substrates.
 3. Verify that substrates are visibly dry and free of moisture.
 4. Verify that roofing membrane surfaces have adequately aged to enable proper bond with base coat.

5. Verify that roofing membrane is free of blisters, splits, open laps, indications of shrinkage, and puncture damage or other indications of impending roof system failure.
6. Application of coatings indicates acceptance of surfaces and conditions.

3.2 RESTORATION PREPARATION

- A. Remove blisters, ridges, buckles, and other substrate irregularities from existing roofing membrane that inhibit new recover boards, primers, adhesives or coatings from conforming to substrate.
 1. Broom clean existing substrate.
 2. Coordinate with VA - COR's inspector to schedule times for tests and inspections before proceeding with installation of recover boards.
 3. Remove materials that are wet or damp.
 4. Before a coating is applied, clean substrate of contaminants such as dirt, debris, oil, and grease that can affect adhesion of coating by power washing at minimum 2000 psi. Remove existing coatings if any. Allow to dry thoroughly.
 5. After cleaning and washing, verify that existing substrate is dry before proceeding with application of coating. Spot check substrates with an electrical capacitance moisture-detection meter.

3.3 FLASHING REPAIR

- A. Repair existing base flashings around parapets, curbs, walls, and penetrations.
 1. Clean substrates of contaminants such as asphalt, sheet materials, dirt, and debris.
- B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.
- C. Repair flashings, copings, and other roof-related sheet metal and trim elements. Reseal joints, replace loose or missing fasteners, and replace components where required to leave in a watertight condition.

3.4 DRAIN INSTALLATION

- A. Where indicated, remove EPDM membrane at drain sumps and replace with new EPDM membrane. Tie-in new membrane to existing membrane.
- B. Remove drain ring and overflow ring and replace with new metal rings and metal strainers.

C. Replace and seal all drains.

3.5 ROOF COATING APPLICATION

A. Detail Course Application: Coat horizontal seams, vertical seams, and drains with detail course of base coat according to manufacturer's written instructions at a minimum 6 inches (150 mm) wide.

1. Apply sufficient base coat over the area to be repaired so the fabric is thoroughly embedded.
2. Embed seam reinforcement fabric over adhered seams, flashing seams, and flashing projection seams.
3. Apply additional base coat to completely cover the reinforcement fabric.

B. Base Coat: Once detail coat has adequately cured, apply base coat to field of roof and flashings according to manufacturer's written instructions by direct pour and roller. Apply in one coat application of 1 gal/100 sq. ft. or as recommended by manufacturer.

C. Finish Coat: Once base coat has adequately cured, apply finish coat according to manufacturer's written instructions, by direct pour and roller. Apply in one coat application of 1 gal/100 sq. ft. Immediately broadcast fine grit mineral into top coat to create a non-slip surface.

3.5 PROTECTION AND CLEAN UP

- A. Keep completed roofing system free of non essential traffic and unrelated work until at least 48 hours after completion of roofing application.
- B. Provide temporary support, such as insulation board, for materials and equipment stored on roof during application.
- C. Protect adjacent construction from disfiguration by run, spillage or overspray, and repair work defaced in this manner.
- D. Remove tools, equipment and surplus materials and clear roof area of debris on completion of work.

- - - E N D - - -

**SECTION 07 60 00
FLASHING AND SHEET METAL**

PART 1 - GENERAL

1.1 DESCRIPTION

Formed sheet metal work for wall and roof flashing, copings, roof edge metal, fasciae, drainage specialties, and formed expansion joint covers are specified in this section.

1.2 RELATED WORK

- A. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.
- B. Membrane base flashings and stripping:
- C. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- D. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- E. Color of factory coated exterior architectural metal and anodized aluminum items: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES Section 07 72 00, ROOF ACCESSORIES, Division 22, PLUMBING sections and Division 23 HVAC sections.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. Aluminum Association (AA):
 - AA-C22A41.....Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
 - AA-C22A42.....Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
 - AA-C22A44.....Chemically etched medium matte with electrolytically deposited metallic compound,

integrally colored coating Class I
Architectural, 0.7-mil thick finish

C. American National Standards Institute/Single-Ply Roofing Institute
(ANSI/SPRI):

ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with
Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620.....Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Aluminum

AAMA 621.....Voluntary Specification for High Performance
Organic Coatings on Coil Coated Architectural
Hot Dipped Galvanized (HDG) and Zinc-Aluminum
Coated Steel Substrates

E. ASTM International (ASTM):

A240/A240M-14.....Standard Specification for Chromium and
Chromium-Nickel Stainless Steel Plate, Sheet
and Strip for Pressure Vessels and for General
Applications.

A653/A653M-11.....Steel Sheet Zinc-Coated (Galvanized) or Zinc
Alloy Coated (Galvanized) by the Hot- Dip
Process

B32-08.....Solder Metal

B209-10.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-12.....Copper Sheet and Strip for Building
Construction

D173-03(R2011).....Bitumen-Saturated Cotton Fabrics Used in
Roofing and Waterproofing

D412-06(R2013).....Vulcanized Rubber and Thermoplastic Elastomers-
Tension

D1187-97(R2011).....Asphalt Base Emulsions for Use as Protective
Coatings for Metal

D1784-11.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and
Chlorinated Poly (Vinyl Chloride) (CPVC)
Compounds

D3656-07.....Insect Screening and Louver Cloth Woven from
Vinyl-Coated Glass Yarns

- D4586-07.....Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association
(SMACNA): Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual
- H. Federal Specification (Fed. Spec):
A-A-1925A.....Shield, Expansion; (Nail Anchors)
UU-B-790A.....Building Paper, Vegetable Fiber
- I. International Code Council (ICC): International Building Code, Current
Edition

1.4 PERFORMANCE REQUIREMENTS

- A. Wind Uplift Forces: Resist the following forces per FM Approvals 1-49:
1. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa
(60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.)
corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
- B. Wind Design Standard: Fabricate and install copings tested per
ANSI/SPRI ES-1 to resist design pressure indicated on Drawings.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT
DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
1. Flashings
 4. Gutter and Conductors
 6. Fascia-cant
- C. Manufacturer's Literature and Data: For all specified items, including:
1. Two-piece counterflashing
 2. Thru wall flashing
 3. Nonreinforced, elastomeric sheeting
 4. Polyethylene coated copper
 5. Fascia-cant
- D. Certificates: Indicating compliance with specified finishing
requirements, from applicator and contractor.

PART 2 - PRODUCTS

2.1 FLASHING AND SHEET METAL MATERIALS

- A. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.
- B. Aluminum Sheet: ASTM B209, alloy 3003-H14 except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14.
- C. Galvanized Sheet: ASTM, A653.
- D. Nonreinforced, Elastomeric Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30°C (-20 °F).

2.2 FLASHING ACCESSORIES

- A. Fasteners:
 - 1. Use copper, copper alloy, bronze, brass, or stainless steel for copper and copper clad stainless steel, and stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
 - 2. Nails:
 - a. Minimum diameter for copper nails: 3 mm (0.109 inch).
 - b. Minimum diameter for aluminum nails 3 mm (0.105 inch).
 - c. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
 - d. Length to provide not less than 22 mm (7/8 inch) penetration into anchorage.
 - 3. Rivets: Not less than 3 mm (1/8 inch) diameter.
 - 4. Expansion Shields: Fed Spec A-A-1925A.
- B. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

- C. Insect Screening: ASTM D3656, 18 by 18 regular mesh.
- D. Roof Cement: ASTM D4586.

2.3 SHEET METAL THICKNESS

- A. Except as otherwise shown or specified use thickness or weight of sheet metal as follows:
- B. Concealed Locations (Built into Construction):
 - 1. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
 - 2. Stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

- A. Jointing:
 - 1. In general, stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
 - 2. Joints shall conform to following requirements:
 - a. Flat-lock joints shall finish not less than 19 mm (3/4 inch) wide.
 - b. Lap joints subject to stress shall finish not less than 25 mm (one inch) wide and shall be soldered and riveted.
 - c. Unsoldered lap joints shall finish not less than 100 mm (4 inches) wide.
 - 3. Flat and lap joints shall be made in direction of flow.
 - 5. Edges of bituminous coated copper, nonreinforced elastomeric sheeting and polyethylene coated copper shall be jointed by lapping not less than 100 mm (4 inches) in the direction of flow and cementing with asphalt roof cement or sealant as required by the manufacturer's printed instructions.
 - 6. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1 1/2 inches) of stainless steel.
 - b. Wire brush to produce a bright surface before soldering lead coated copper.
 - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
 - d. Completely remove acid and flux after soldering is completed.

B. Expansion and Contraction Joints:

1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
2. Space joints as shown or as specified.
3. Space expansion and contraction joints for stainless steel, at intervals not exceeding 7200 mm (24 feet).
4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.
5. Fabricate slip-type or loose locked joints and fill with sealant unless otherwise specified.
6. Fabricate joint covers of same thickness material as sheet metal served.

C. Cleats:

1. Fabricate cleats to secure flashings and sheet metal work over 300 mm (12 inches) wide and where specified.
2. Provide cleats for maximum spacing of 300 mm (12 inch) centers unless specified otherwise.
3. Form cleats of same metal and weights or thickness as the sheet metal being installed unless specified otherwise.
4. Fabricate cleats from 50 mm (2 inch) wide strip. Form end with not less than 19 mm (3/4 inch) wide loose lock to item for anchorage. Form other end of length to receive nails free of item to be anchored and end edge to be folded over and cover nail heads.

D. Edge Strips or Continuous Cleats:

1. Fabricate continuous edge strips where shown and specified to secure loose edges of the sheet metal work.
2. Except as otherwise specified, fabricate edge strips or minimum 0.6 mm (0.024 inch) thick stainless steel 1.25 mm (0.050 inch) thick aluminum.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.

5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4-inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel or 1.6 mm (0.0625 inch) thick aluminum.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings (cap flashings), fascias, gravel stops, wall copings, by folding edge back 13 mm (1/2 inch) and bending out 45 degrees from vertical to carry water away from the wall.
2. Form drip to provide hook to engage cleat or edge strip for fastening for not less than 19 mm (3/4 inch) loose lock where shown.

F. Edges:

1. Edges of flashings concealed in masonry joints opposite drain side shall be turned up 6 mm (1/4 inch) to form dam, unless otherwise specified or shown otherwise.
2. Finish exposed edges of flashing with a 6 mm (1/4 inch) hem formed by folding edge of flashing back on itself when not hooked to edge strip or cleat. Use 6 mm (1/4 inch) minimum penetration beyond wall face with drip for through-wall flashing exposed edge.
3. All metal roof edges shall meet requirements of IBC, current edition.

G. Metal Options:

1. Where options are permitted for different metals use only one metal throughout.
2. Stainless steel may be used in concealed locations for fasteners of other metals exposed to view.

2.5 FINISHES

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.

C. Finish exposed metal surfaces as follows, unless specified otherwise:

1. Stainless Steel: Finish No. 2B or 2D.
2. Aluminum:
 - a. Clear Finish: AA-C22A41 medium matte, clear anodic coating, Class 1 Architectural, 18 mm (0.7 mils) thick.
 - b. Colored Finish: AA-C22A42 (anodized) or AA-C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1 Architectural, 18 mm (0.7 mils) thick. Dyes will not be accepted.
 - c. Fluorocarbon Finish: AAMA 620, high performance organic coating.
 - d. Mill finish.
3. Steel and Galvanized Steel:
 - b. Manufacturer's finish:
 - 1) Baked on prime coat over a phosphate coating.
 - 2) Baked-on prime and finish coat over a phosphate coating.
 - 3) Fluorocarbon Finish: AAMA 621, high performance organic coating.

2.6 THROUGH-WALL FLASHINGS

- A. Form through-wall flashing to provide a mechanical bond or key against lateral movement in all directions. Install a sheet having 2 mm (1/16 inch) deep transverse channels spaced four to every 25 mm (one inch), or ribbed diagonal pattern, or having other deformation unless specified otherwise.
 1. Fabricate in not less than 2400 mm (8 feet) lengths; 3000 mm (10 feet) maximum lengths.
 2. Fabricate so keying nests at overlaps.
- B. For Masonry Work When Concealed Except for Drip:
 1. Stainless steel.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.
 3. Form exposed portions of flashing with drip, approximately 6 mm (1/4 inch) projection beyond wall face.
- C. For Masonry Work When Exposed Edge Forms a Receiver for Counter Flashing:
 1. Use same metal and thickness as counter flashing.
 2. Form an integral dam at least 5 mm (3/16 inch) high at back edge.

3. Form exposed portion as snap lock receiver for counter flashing upper edge.

2.7 BASE FLASHING

- A. Use metal base flashing at vertical surfaces intersecting built-up roofing without cant strips or where shown.
 1. Use either copper, or stainless steel, thickness specified unless specified otherwise.
 2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use either 0.5 Kg (20 oz) copper or 0.5 mm (0.018 inch) stainless steel.
 3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
 4. Use stainless steel at pipe flashings.
- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.
- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
 - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
 - b. Allow for loose fit around and into the pipe.
 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
 - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
 - b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. Stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
 - 1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
 - 2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
 - 3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
 - 4. Manufactured assemblies may be used.
 - 5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
 - 6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.
- C. One-piece Counterflashing:
 - 1. Back edge turned up and fabricate to lock into reglet in concrete.
 - 2. Upper edge formed to extend full depth of masonry unit in mortar joint with back edge turned up 6 mm (1/4 inch).
- D. Two-Piece Counterflashing:
 - 1. Receiver to extend into masonry wall depth of masonry unit with back edge turned up 6 mm (1/4 inch) and exposed edge designed to receive and lock counterflashing upper edge when inserted.
 - 2. Counterflashing upper edge designed to snap lock into receiver.
- E. Surface Mounted Counterflashing; one or two piece:
 - 1. Use at existing or new surfaces where flashing cannot be inserted in vertical surface.
 - 2. One piece fabricate upper edge folded double for 65 mm (2 1/2 inches) with top 19 mm (3/4 inch) bent out to form "V" joint sealant pocket with vertical surface. Perforate flat double area against vertical surface with horizontally slotted fastener holes at 400 mm (16 inch) centers between end holes. Option: One piece surface mounted counter-flashing (cap flashing) may be used. Fabricate as detailed on Plate 51 of SMACNA Architectural Sheet Metal Manual.

3. Two pieces: Fabricate upper edge to lock into surface mounted receiver. Fabricate receiver joint sealant pocket on upper edge and lower edge to receive counterflashing, with slotted fastener holes at 400 mm (16 inch) centers between upper and lower edge.

F. Pipe Counterflashing:

1. Form flashing for water-tight umbrella with upper portion against pipe to receive a draw band and upper edge to form a "V" joint sealant receiver approximately 19 mm (3/4 inch) deep.
2. Fabricate 100 mm (4 inch) over lap at end.
3. Fabricate draw band of same metal as counter flashing. Use 0.6 Kg (24 oz) copper or 0.33 mm (0.013 inch) thick stainless steel or copper coated stainless steel.
4. Use stainless steel bolt on draw band tightening assembly.
5. Vent pipe counter flashing may be fabricated to omit draw band and turn down 25 mm (one inch) inside vent pipe.

- G. Where vented edge decks intersect vertical surfaces, form in one piece, shape to slope down to a point level with and in front of edge-set notched plank; then, down vertically, overlapping base flashing.

2.9 CONDUCTORS (DOWNSPOUTS)

- A. Fabricate conductors of same metal and thickness as gutters in sections approximately 3000 mm (10 feet) long [with 19 mm (3/4 inch) wide flat locked seams].

1. Fabricate open face channel shape with hemmed longitudinal edges.

- B. Fabricate elbows by mitering, riveting, and soldering except seal aluminum in lieu of solder. Lap upper section to the inside of the lower piece.

- C. Fabricate conductor brackets or hangers of same material as conductor, 2 mm (1/16 inch) thick by 25 mm (one inch) minimum width. Form to support conductors 25 mm (one inch) from wall surface in accordance with Architectural Sheet Metal Manual Plate 34, Design C for rectangular shapes and E for round shapes.

D. Conductor Heads:

1. Fabricate of same material as conductor.
2. Fabricate conductor heads to not less than 250 mm (10 inch) wide by 200 mm (8 inch) deep by 200 mm (8 inches) from front to back.

3. Form front and side edges channel shape not less than 13 mm (1/2 inch) wide flanges with edge hemmed.
4. Slope bottom to sleeve to conductor or downspout at not less than 60 degree angle.
5. Extend wall edge not less than 25 mm (one inch) above front edge.
6. Solder joints for water tight assembly.
7. Fabricate outlet tube or sleeve at bottom not less than 50 mm (2 inches) long to insert into conductor.

2.10 REGLETS

- A. Fabricate reglets of one of the following materials:
 2. Stainless steel, not less than 0.3 mm (0.012 inch) thick.
 3. Plastic coated extruded aluminum, not less than 1.4 mm (0.055 inch) thick prefilled with butyl rubber sealer and complete with plastic wedges inserted at 1000 mm (40 inches) on centers.
- B. Fill open-type reglets with fiberboard or other suitable separator, to prevent crushing of the slot during installation.
- C. Bend edges of reglets for setting into concrete to an angle of not less than 45 degrees, and make wide enough to provide firm anchorage in the concrete.
- D. Fabricate reglets for building into horizontal masonry mortar joints not less than 19 mm (3/4 inch) deep, nor more than 25 mm (one inch) deep.
- E. Fabricate mitered corners, fittings, and special shapes as may be required by details.
- F. Reglets for concrete may be formed to receive flashing and have a 10 mm (3/8 inch), 45 degree snap lock.

2.11 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING

- A. Flashing at penetrations through roofing shall consist of a metal collar, sheet metal flashing sleeve and hood.
- B. Fabricate collar with roof flange of 1.2 mm (0.047 inch) minimum thick black iron or galvanized steel sheet.
 1. Fabricate inside diameter of collar 100 mm (4 inches) larger than the outside diameter of the item penetration the roofing.

2. Extend collar height from structural roof deck to not less than 350 mm (14 inches) above roof surface.
 3. Fabricate collar roof flange not less than 100 mm (4 inches) wide.
 4. Option: Collar may be of steel tubing 3 mm (0.125 inch) minimum wall thickness, with not less than four, 50 mm x 100 mm x 3 mm (2 inch by 4 inch by 0.125 inch) thick tabs bottom edge evenly spaced around tube in lieu of continuous roof flange. Full butt weld joints of collar.
- C. Fabricate sleeve base flashing with roof flange of estainless steel.
1. Fabricate sleeve roof flange not less than 100 mm (4 inches) wide.
 2. Extend sleeve around collar up to top of collar.
 3. Flange bottom of sleeve out not less than 13 mm (1/24 inch) and soldered to 100 mm (4 inch) wide flange to make watertight.
 4. Fabricate interior diameter 50 mm (2 inch) greater than collar.
- D. Fabricate hood counter flashing from same material and thickness as sleeve.
1. Fabricate the same as pipe counter flashing except allow not less than 100 mm (4 inch) lap below top of sleeve and to form vent space minimum of 100 mm (4 inch) wide.
 2. Hem bottom edge of hood 13 mm (1/2 inch).
 3. Provide a 50 mm (2 inch) deep drawband.
- E. Fabricate insect screen closure between sleeve and hood. Secure screen to sleeve with sheet metal screws.

2.12 SCUPPERS

- A. Fabricate scuppers with minimum of 100 mm (4 inch) wide flange.
- B. Provide flange at top on through wall scupper to extend to top of base flashing.
- C. Fabricate exterior wall side to project not less than 13 mm (1/2 inch) beyond face of wall with drip at bottom outlet edge.
- D. Fabricate not less than 100 mm (4 inch) wide flange to lap behind gravel stop fascia.
- E. Fabricate exterior wall flange for through wall scupper not less than 25 mm (one inch) wide on top and sides with edges hemmed.
- F. Fabricate gravel stop bar of 25 mm x 25 mm (one by one inch) angle strip soldered to bottom of scupper.

- G. Fabricate scupper not less than 200 mm (8 inch) wide and not less than 125 mm (5 inch) high for through wall scupper.
- H. Solder joints watertight.

2.13 GOOSENECK ROOF VENTILATORS

- A. Form of 1.3 mm (0.0508 inch) thick sheet aluminum, reinforce as necessary for rigidity, stiffness, and connection to curb, and to be watertight.
 - 1. Form lower-edge to sleeve to curb.
 - 2. Curb:
 - a. Form for 100 mm (4 inch) high sleeve to ventilator.
 - b. Form for concealed anchorage to structural curb and to bear on structural curb.
 - c. Form bottom edge of curb as counterflashing to lap base flashing.
- B. Provide open end with 1.6 mm (16 gage), stainless steel wire guard of 13 mm (1/2 inch) square mesh.
 - 1. Construct suitable aluminum angle frame to retain wire guard.
 - 2. Rivet angle frame to end of gooseneck.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
 - 1. Install flashing and sheet metal items as shown in Sheet Metal and Air Conditioning Contractors National Association, Inc., publication, ARCHITECTURAL SHEET METAL MANUAL, except as otherwise shown or specified.
 - 2. Apply Sealant as specified in Section 07 92 00, JOINT SEALANTS.
 - 3. Apply sheet metal and other flashing material to surfaces which are smooth, sound, clean, dry and free from defects that might affect the application.
 - 4. Remove projections which would puncture the materials and fill holes and depressions with material compatible with the substrate. Cover holes or cracks in wood wider than 6 mm (1/4 inch) with sheet metal compatible with the roofing and flashing material used.
 - 5. Coordinate with masonry work for the application of a skim coat of mortar to surfaces of unit masonry to receive flashing material before the application of flashing.

6. Apply a layer of 7 Kg (15 pound) saturated felt followed by a layer of rosin paper to wood surfaces to be covered with copper. Lap each ply 50 mm (2 inch) with the slope and nail with large headed copper nails.
7. Confine direct nailing of sheet metal to strips 300 mm (12 inch) or less wide. Nail flashing along one edge only. Space nail not over 100 mm (4 inches) on center unless specified otherwise.
8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
 - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
 - b. Paint dissimilar metal with a coat of bituminous paint.
 - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.

16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
 - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
 - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.
3. Exposed edge of flashing may be formed as a receiver for two piece counter flashing as specified.
4. Terminate exterior edge beyond face of wall approximately 6 mm (1/4 inch) with drip edge where not part of counter flashing.
5. Turn back edge up 6 mm (1/4 inch) unless noted otherwise where flashing terminates in mortar joint or hollow masonry unit joint.
6. Terminate interior raised edge in masonry backup unit approximately 38 mm (1 1/2 inch) into unit unless shown otherwise.
7. Under copings terminate both edges beyond face of wall approximately 6 mm (1/4 inch) with drip edge.
8. Lap end joints at least two corrugations, but not less than 100 mm (4 inches). Seal laps with sealant.
9. Where dowels, reinforcing bars and fastening devices penetrate flashing, seal penetration with sealing compound. Sealing compound is specified in Section 07 92 00, JOINT SEALANTS.
10. Coordinate with other work to set in a bed of mortar above and below flashing so that total thickness of the two layers of mortar and flashing are same as regular mortar joint.

11. Where ends of flashing terminate turn ends up 25 mm (1 inch) and fold corners to form dam extending to wall face in vertical mortar or veneer joint.
 12. Turn flashing up not less than 200 mm (8 inch) between masonry or behind exterior veneer.
 13. When flashing terminates in reglet extend flashing full depth into reglet and secure with lead or plastic wedges spaced 150 mm (6 inch) on center.
 14. Continue flashing around columns:
 - a. Where flashing cannot be inserted in column reglet hold flashing vertical leg against column.
 - b. Counterflash top edge with 75 mm (3 inch) wide strip of saturated cotton unless shown otherwise. Secure cotton strip with roof cement to column. Lap base flashing with cotton strip 38 mm (1 1/2 inch).
- C. Flashing at Top of Concrete Floors (except where shelf angles occur):
Place flashing in horizontal masonry joint not less than 200 mm (8 inch) below floor slab and extend into backup masonry joint at floor slab 38 mm (1 1/2 inch).
- D. Flashing at Cavity Wall Construction: Where flashing occurs in cavity walls turn vertical portion up against backup under waterproofing, if any, into mortar joint. Turn up over insulation, if any, and horizontally through insulation into mortar joint.
- E. Flashing at Veneer Walls:
1. Install near line of finish floors over shelf angles or where shown.
 2. Turn up against sheathing.
 3. At stud framing, hemtop edge 19 mm (3/4 inch) and secure to each stud with stainless steel fasteners through sheathing.
 4. At concrete backing, extend flashing into reglet as specified.
 5. Coordinate with installation of waterproofing or asphalt felt for lap over top of flashing.
- H. Door Sill Flashing:
1. Install flashing under bottom of plate sills of doors over curbs opening onto roofs. Extend flashing out to form counter flashing or receiver for counter flashing over base flashing. Set in sealant.

2. Extend sill flashing 200 mm (8 inch) beyond jamb opening. Turn ends up one inch in vertical masonry joint, extend end to face of wall. Join to counter flashing for water tight joint.
 3. Where doors thresholds cover over waterproof membranes install sill flashing over water proof membrane under thresholds. Extend beyond opening to cover exposed portion of waterproof membrane and not less than 150 mm (6 inch) beyond door jamb opening at ends. Turn up approximately 6 mm (1/4 inch) under threshold.
- I. Flashing at Masonry, Stone, or Precast Concrete Copings:
1. Install flashing with drips on both wall faces unless shown otherwise.
 2. Form penetration openings to fit tight against dowel or other item with edge turned up. Seal penetrations with sealant.

3.3 BASE FLASHING

- A. Install where roof membrane type base flashing is not used and where shown.
1. Install flashing at intersections of roofs with vertical surfaces or at penetrations through roofs, to provide watertight construction.
 2. Install metal flashings and accessories having flanges extending out on top of the built-up roofing before final bituminous coat and roof aggregate is applied.
 3. Set flanges in heavy trowel coat of roof cement and nail through flanges into wood nailers over bituminous roofing.
 4. Secure flange by nailing through roofing into wood blocking with nails spaced 75 mm (3 inch) on centers or, when flange over 100 mm (4 inch) wide terminate in a 13 mm (1/2 inch) folded edge anchored with cleats spaced 200 mm (8 inch) on center. Secure one end of cleat over nail heads. Lock other end into the seam.
- B. For long runs of base flashings install in lengths of not less than 2400 mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.
- C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:

1. Install counterflashing over and in conjunction with installation of base flashings, except as otherwise specified or shown.
2. Install counterflashing to lap base flashings not less than 100 mm (4 inch).
3. Install upper edge or top of counterflashing not less than 225 mm (9 inch) above top of the roofing.
4. Lap joints not less than 100 mm (4 inch). Stagger joints with relation to metal base flashing joints.
5. Use surface applied counterflashing on existing surfaces and new work where not possible to integrate into item.
6. When fastening to concrete or masonry, use screws driven in expansion shields set in concrete or masonry. Use screws to wood and sheet metal. Set fasteners in mortar joints of masonry work.

B. One Piece Counterflashing:

1. Where flashing is installed at new masonry, coordinate to insure proper height, embed in mortar, and end lap.
2. Where flashing is installed in reglet in concrete insert upper edge into reglet. Hold flashing in place with lead wedges spaced not more than 200 mm (8 inch) apart. Fill joint with sealant.
3. Where flashing is surface mounted on flat surfaces.
 - a. When top edge is double folded anchor flat portion below sealant "V" joint with fasteners spaced not over 400 mm (16 inch) on center:
 - 1) Locate fasteners in masonry mortar joints.
 - 2) Use screws to sheet metal or wood.
 - b. Fill joint at top with sealant.
4. Where flashing or hood is mounted on pipe.
 - a. Secure with draw band tight against pipe.
 - b. Set hood and secure to pipe with a one by 25 mm x 3 mm (1 x 1/8 inch) bolt on stainless steel draw band type clamp, or a stainless worm gear type clamp.
 - c. Completely fill joint at top with sealant.

C. Two-Piece Counterflashing:

1. Where receiver is installed at new masonry coordinate to insure proper height, embed in mortar, and lap.

2. Surface applied type receiver:
 - a. Secure to face construction in accordance, with manufacturers instructions.
 - b. Completely fill space at the top edge of receiver with sealant.
3. Insert counter flashing in receiver in accordance with fabricator or manufacturer's instructions and to fit tight against base flashing.
- D. Where vented edge occur install so lower edge of counterflashing is against base flashing.
- E. When counter flashing is a component of other flashing install as shown.

3.5 REGLETS

- A. Install reglets in a manner to provide a watertight installation.
- B. Locate reglets not less than 225 mm (9 inch) nor more than 400 mm (16 inch) above roofing, and not less than 125 mm (5 inch) nor more than 325 mm (13 inch) above cant strip.
- C. Butt and align end joints on each section of reglet and securely hold in position until concrete or mortar are hardened:
 1. Coordinate reglets for anchorage into concrete with formwork construction.
 2. Coordinate reglets for masonry to locate horizontally into mortar joints.

3.7 ENGINE EXHAUST PIPE OR STACK FLASHING

- A. Set collar where shown and secure roof tabs or flange of collar to structural deck with 13 mm (1/2 inch) diameter bolts.
- B. Set flange of sleeve base flashing not less than 100 mm (4 inch) beyond collar on all sides as specified for base flashing.
- C. Install hood to above the top of the sleeve 50 mm (2 inch) and to extend from sleeve same distance as space between collar and sleeve beyond edge of sleeve:
 1. Install insect screen to fit between bottom edge of hood and side of sleeve.
 2. Set collar of hood in high temperature sealant and secure with one by 3 mm (1/8 inch) bolt on stainless steel draw band type, or stainless steel worm gear type clamp. Install sealant at top of head.

3.8 CONDUCTORS (DOWNSPOUTS)

- A. Where scuppers discharge into downspouts install conductor head to receive discharge with back edge up behind drip edge of scupper. Fasten and seal joint. Sleeve conductors to gutter outlet tubes and fasten joint and joints between sections.
- B. Set conductors plumb and clear of wall, and anchor to wall with two anchor straps, located near top and bottom of each section of conductor. Strap at top shall be fixed to downspout, intermediate straps and strap at bottom shall be slotted to allow not less than 13 mm (1/2 inch) movement for each 3000 mm (10 feet) of downspout.
- C. Install elbows, offsets and shoes where shown and required. Slope not less than 45 degrees.

3.9 GOOSENECK ROOF VENTILATORS

- A. Install on structural curb not less than 200 mm (8 inch) high above roof surface.
- B. Securely anchor ventilator curb to structural curb with fasteners spaced not over 300 mm (12 inch) on center.
- C. Anchor gooseneck to curb with screws having nonprene washers at 150 mm (6 inch) on center.

- - - E N D - - -

**SECTION 07 71 00
ROOF SPECIALTIES**

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies copings and expansion joints.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- B. Color and Texture of Finish: Section 09 06 00, SCHEDULE FOR FINISHES
- C. Sealant Material and Installation: Section 07 92 00, JOINT SEALANTS.
- D. General Insulation: Section 07 21 13, THERMAL INSULATION
- E. Rigid Insulations for Roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL:

- A. Provide roof accessories that products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide products made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.
- D. Provide each accessory with FM approval listing for class specified.

1.4 PERFORMANCE REQUIREMENTS:

- A. Provide roof accessories that withstand exposure to weather and resist thermal movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, or installation.
- B. Provide roof accessories listed in FM Approvals "RoofNav" and approved for windstorm classification Class 1-150. Identify materials with FM Approval markings.
- C. Manufacture and install roof accessories to allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
 - 1. Provide clips that resist rotation and avoid shear stress as a result of thermal movements.

2. For design purposes, base provisions for thermal movement on assumed ambient temperature (range) from minus 18 degrees C (0 degrees F), ambient to 82 degrees C (180 degrees F).

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
- C. Samples: Representative sample panel of color-anodized aluminum not less than 101 x 101 mm (4 x 4 inches), except extrusions are to be of a width not less than section to be used. Submit sample that shows coating with integral color and texture. Include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.
- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.6 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - A240/A240M-14.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 - A653/A653M-13.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 - A666-10.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
 - B209-14.....Aluminum and Aluminum Alloy-Sheet and Plate
 - B209M-14.....Aluminum and Aluminum Alloy-Sheet and Plate (Metric)
 - B221-14.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

- B221M-13.....Aluminum-Alloy Extruded Bars, Rods, Wire,
Shapes, and Tubes (Metric)
- B32-08(R2014).....Solder Metal
- B370-12.....Copper Sheet and Strip for Building
Construction
- B882-10.....Pre-Patinated Copper for Architectural
Applications
- C612-14.....Mineral Fiber Block and Board Thermal
Insulation
- D1187/D1187M-97 (R2011)..Asphalt-Base Emulsions for Use as Protective
Coatings for Metal
- D1970/D1970M-14.....Self-Adhering Polymer Modified Bituminous Sheet
Materials Used as Steep Roofing Underlayment
for Ice Dam Protection
- D226/D226M-09.....Asphalt-Saturated Organic Felt Used in Roofing
and Waterproofing
- D4869/D4969M-05(R2011)..Asphalt-Saturated Organic Felt Underlayment
Used In Steep Slope Roofing
- C. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06.....Metal Finishes Manual
- D. American Architectural Manufacturers Association (AAMA):
2605-11.....High Performance Organic Coatings on
Architectural Extrusions and Panels.
611-14.....Anodized Architectural Aluminum
- E. FM Global (FM):
RoofNav.....Approved Roofing Assemblies and Products

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Stainless-Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- F. Recycled Content of Metal Products: Postconsumer recycled content plus
one-half of preconsumer recycled content
- G. Insulation: ASTM C612, Class 1 or 2.
- H. Asphalt Coating: ASTM D1187, Type I, quick setting.

2.2 UNDERLAYMENT:

- A. Self-Adhering Modified Bitumen Underlayment:
1. Provide self-adhering modified bitumen membrane underlayment material in compliance with ASTM D1970/D1970M, suitable for use as underlayment for metal copings and fascias.
 2. Provide membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions (stable after testing at 116 degrees C (240 degrees F)).
 3. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied above.
 4. Provide primer.
- B. Felt Underlayment: Provide No. 30 asphalt saturated organic, non-perforated felt underlayment in compliance with ASTM D226/D226M, Type II, or ASTM D4869/D4869M.
- C. Slip Sheet: Provide 0.24 kg per square meter (5 pounds per 100 sf) rosin sized unsaturated building paper for slip sheet.

2.3 COPINGS:

- A. Fabricate of aluminum sheet not less than 2 mm (0.08 inch) thick or 0.5 mm (0.018 inch) thick stainless steel
- B. Turn outer edges down each face of wall as shown on construction documents.
- C. Maximum lengths of 3.05 M (10 feet).
- D. Shop fabricate external and internal corners as one-piece assemblies with not less than 305 mm (12 inch) leg lengths.
- E. Provide 101 mm (4 inch) wide 0.81 mm (0.032 inch) thick watertight joint covers.
- F. Provide anchor gutter bar of 0.81 mm (0.032 inch) thick with anchor holes formed for underside of joint.
- G. Provide concealed guttered splice plate of 0.81 mm (0.032 inch) thick with butyl or other resilient seal strips anchored to splice plate for underside of joint. Use galvanized steel anchor plate providing compression spring anchoring of coping cover.
- H. Finish: Three-coat fluoropolymer as specified.

2.4 EXTRUDED ALUMINUM FASCIA-CANT SYSTEM:

- A. The fascia-cant system consists of three (3) pieces, an extruded aluminum fascia, a galvanized steel cant, and an aluminum compression clamp.
- B. Furnish in stock lengths of not more than 3.05 M (10 feet) long.
- C. Form fascia from not less than 2 mm (0.070 inch) thick aluminum. Provide 101 mm (4 inch) wide 0.81 mm (0.032-inch) thick concealed sheet aluminum joint cover plates in back of fascia.
- D. Form cant strip from galvanized steel not less than 0.75 mm (0.0299 inch) thick, to profile shown and design to hold lower edge of the fascia.
- E. Form compression clamp of not less than 0.81 mm (0.032 inch) thick aluminum designed to hold the top edge of the fascia and the built-up flashing.
- F. Internal and external corners:
 - 1. Factory fabricate and fully weld mitered joints.
 - 2. Furnish corner sections in manufacturers standard sizes to match existing with not less than 305 mm (12 inch) leg lengths.
- H. Factory fabricated scupper assemblies:
 - 1. Fabricate scupper assembly with extended plates to match fascia-cant in 508 mm (20 inch) minimum lengths.
 - 2. Extend outlet opening not less than 50 mm (2 inches) with drip edge.
 - 3. Fabricate with stainless steel core or sleeve to drain water from toe of cant and flash in to built-up roofing with 101 mm (4 inch) wide flange.
- I. Finish on aluminum: Three-coat fluoropolymer as specified.

2.7 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS:

- A. Fabricate in 3.0 M (10 foot) lengths with fastener openings slotting for expansion not over 610 mm (24 inch) centers.
- B. Provide four-way expansion, for joint widths shown on construction documents.
- C. Mill finish.
- D. Form waterstop or moisture seals of continuous sheets of neoprene, not less than 0.81 mm (0.032 inch) thick.

- E. Fabricate corners as one (1) piece assembly with mitered and welded joint and least dimension legs not less than 300 mm (12 inches) long.
- F. Factory fabricate end caps and transitions to insure waterproof assembly.
- G. Five (5) piece assembly:
 - 1. Roof expansion joint cover system consists of an extruded aluminum cover, extruded frame or curb vertical section, galvanized steel cant, and aluminum compression clamp counter flashing, complete with moisture seals. Form cover and vertical section from extruded aluminum, 2 mm (0.080 inch) minimum thickness with spring stainless steel tension or pivot bar.
 - 2. Form cant from galvanized steel not less than 0.8 mm (0.029 inch) thick formed to profile shown on construction documents.
 - 3. Form splice plates of not less than 0.81 mm (0.032 inch) thick aluminum sheet.
 - 4. Form counter flashing member of 1.3 mm (0.050 inch) thick sheet aluminum, secured with screws to the top edge of the vertical section and providing compression clamp over base flashing.
 - 5. Provide compression gasket separating cover from curb bearing.
- H. Two (2) piece assembly:
 - 1. Roof expansion joint system consists of an extruded aluminum cover combination extruded aluminum frame or curb with integral adjustable counter flashing flange, and moisture seals.
 - 2. Form cover from extruded aluminum 2 mm (0.078 inch) minimum thickness.
 - 3. Form cover anchor system of stainless steel pivot bar.
 - 4. Form frame assembly of not less than 2 mm (0.076 inch) aluminum except for flashing portion.
 - 5. Provide compression gasket separating cover from curb at bearing.

2.8 FINISH:

- A. In accordance with NAAMM AMP 500-505.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.
 - 1. Concealed Surface Finish: Apply pretreatment and manufacturer's standard acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.013 mm (0.5 mil).

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Examine substrates, areas, and conditions, 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 where applicable, and securely anchored.
- C. Underlayment Installation:
 - 1. Self-Adhering Sheet Underlayment:
 - a. Apply primer as required by manufacturer.
 - b. Comply with temperature restrictions of underlayment manufacturer for installation.
 - c. Apply wrinkle free, in shingle fashion to shed water, and with end laps of not less than 152 mm (6 inches) staggered 610 mm (24 inches) between courses.
 - d. Overlap side edges not less than 89 mm (3-1/2 inches). Roll laps with roller.
 - e. Cover underlayment within 14 days.
 - f. Apply continuously under copings and roof-edge fascias and gravel stops.
 - g. Coordinate application of self-adhering sheet underlayment under roof specialties with requirements for continuity with adjacent air barrier materials.
 - 3. Slip Sheet:
 - a. Install with tape or adhesive for temporary anchorage to minimize use of mechanical fasteners under roof specialties.
 - b. Apply in shingle fashion to shed water, with lapped joints of not less than 50 mm (2 inches).
- D. Install roof accessories where indicated in construction documents.
- E. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise. Provide fasteners suitable for application, for metal types being secured and designed to meet performance requirements.
- F. Where soldered joints are required, clean surfaces to be soldered, removing oils and foreign matter.
 - 1. Pre-tin edges of sheets to be soldered to a width of 38 mm (1-1/2 inches).

2. Reduce pre-tinning where pre-tinned surface would show in completed work.
 3. Tin edges of uncoated copper sheets using solder for copper.
 4. Do not use torches for soldering.
 5. Heat surfaces to receive solder and flow solder into joint.
 6. Fill joint completely.
 7. Completely remove flux and spatter from exposed surfaces.
- G. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.
- H. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions.
- I. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
- J. Gravel Stops and Fascias:
1. Install gravel stops and fascia with butt joints with approximately 6 mm (1/4 inch) space for expansion.
 2. Over each joint provide cover plates of sheet aluminum, complete with concealed sheet aluminum flashing, centered under each joint.
 3. Provide lap cover plates and concealed flashing over the gravel stop and fascia not less than 101 mm (4 inches).
 4. Extend concealed flashing over built-up roofing, embed in roof cement and turn down over face of blocking at roof edge.
- K. Aluminum Coping:
1. Install sections of coping with approximately 6 mm (1/4-inch) space between ends of sections.
 2. Center joint gutter bar and covers at joints and lock in place.
 3. When snap-on system is installed ensure front and back edges are locked in place.
- L. Fascia-Cant System:
1. Install galvanized steel cant; coordinate with roofing work and after completion of roofing work install extruded aluminum fascia, concealed joint cover plate, and aluminum compression clamp, where shown in construction documents.
 2. Install system to allow for expansion and contraction with 6 mm (1/4 inch) space between extruded aluminum members and galvanized steel cant as required by manufacturer of system.

3. Offset joints in extruded aluminum members from galvanized steel cant joints.

M. Expansion Joint Covers:

1. Install to terminate base flashing 203 mm (8 inches) above roof.
2. Install moisture seals to drain water to outlets that do not permit water to enter building.
3. Provide stainless steel screws when exposed.
4. Three piece assembly:
 - a. Install curb section with screws to wood blocking, allowing 6 mm (1/4 inch) at butt joints between sections with splice plate at joint.
 - b. Install cant to wood blocking by nailing along horizontal flange every 152 mm (6 inches), with galvanized roofing nails 25 mm (1 inch) long.
 - c. After completion of base flashing install cap flashing and compression clamp and fasten to the curb or metal cant with stainless steel self-tapping screws with neoprene washers under head spaced approximately 457 mm (18 inches) on center.
 - d. Install expansion joint cover with a 6 mm (1/4 inch) wide end joints.
 - e. Install over end joint a cover plate complete with concealed aluminum flashing, centered under each joint. Fabricate flashing to lap cover not less than 101 mm (4 inches).
5. Two piece assembly:
 - a. Install curb section with screws allowing 6 mm (1/4 inch) space at end joints with splice plate at joint.
 - b. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
 - c. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 610 mm (24 inches) on center.
 - d. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 101 mm (4 inches).

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating

(complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on one (1) side.

- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two (2) coats of asphalt coating.

3.3 ADJUSTING:

- A. Adjust expansion joints to close tightly and be watertight; insuring maximum allowance for building movement.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

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**SECTION 07 72 00
ROOF ACCESSORIES**

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section specifies roof hatches; equipment supports; gravity ventilators; and metal grating roof walkway system.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- B. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- D. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY ASSURANCE:

- A. Provide roof accessories that are the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. For each accessory type provide the same product made by the same manufacturer.
- C. Assemble each accessory to the greatest extent possible before delivery to the site.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS
- C. Samples: Submit representative sample panel of color anodized aluminum not less than 101 x 101 mm (4 x 4 inches). For extrusions, submit width not less than section to be installed. Show coating with integral color and texture and include manufacturer's identifying label.
- D. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- E. Manufacturer's Literature and Data: Each item specified.
- F. Certificates: Stating that aluminum has been given specified thickness of anodizing.

1.5 APPLICABLE PUBLICATIONS:

- A. The publications listed below form a part of this specification to the extend referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - RR-G-1602D.....Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)
- C. ASTM International (ASTM):
 - A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process
 - B209-14.....Aluminum and Aluminum Alloy-Sheet and Plate
 - B209M-14.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
 - B221-14.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - B221M-13.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)
 - C726-12.....Mineral Wool Roof Insulation Board
 - C1289-14a.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - D1187/D1187M-97(R2011)..Asphalt-Base Emulsions for Use as Protective Coatings for Metal
- D. National Association of Architectural Metal Manufacturers (NAAMM):
 - AMP 500 Series.....Metal Finishes Manual
- E. American Architectural Manufacturers Association (AAMA):
 - 2603-13.....Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels
 - 2605-13.....High Performance Organic Coatings on Architectural Extrusions and Panels.
 - 611-14.....Anodized Architectural Aluminum
 - 621-02.....High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates
- F. American Society of Civil Engineers (ASCE):

ASCE 7-10.....Minimum Design Loads for Buildings and Other
Structures

G. U.S. National Archives and Records Administration (NARA):

29 CFR 1910.23.....Guarding Floor and Wall Openings and Holes

PART 2 - PRODUCTS

2.1 MATERIALS:

- A. Aluminum, Extruded: ASTM B221M (B221).
- B. Aluminum Sheet: ASTM B209M (B209).
- C. Galvanized Sheet Steel: ASTM A653/A653M; G-90 coating.
- D. Metal Grating for Roof Walkway: Fed. Spec. RR-G-1602.
- E. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content .
- F. Asphalt Coating: ASTM D1187/D1187M, Type I, quick setting.

2.2 ROOF HATCH (SCUTTLE): EXISTING, REUSED. VERIFY ON SITE

2.3 EQUIPMENT SUPPORTS:

- A. Reuse existing supports that remain in place. Reinstall salvaged supports, provide new supports where damaged or incompatible with new work.
- B. Supported Load Capacity: to match existing and accommodate load, supported equipment, pipes, conduits, etc..
- C. Fabricate equipment supports from 1.3 mm (0.0516 inch) thick galvanized ASTM A653/A653M steel fabricate with welded corners and with seams joined by continuous water and air tight welds.
- C. Equipment supports to be internally reinforced with angles 1.22 m (48 inches) on center.
- D. Form exterior curb with integral base.
- E. Use galvanized steel liners for curbs having inside dimension over 305 mm (12 inches).
- F. Internally insulate with 38 mm (1-1/2 inch) glass-fiber board insulation (ASTM C726).
- G. Fabricate curb with a minimum height of 203 mm (8 inches) above roof surface.
- H. Attach preservative treated wood nailers to top of curb. Provide 50 mm (2 inch) by 50 mm (2 inch) minimum nominal size on curb with openings

and 50 mm (2 inch) thick, width of curb up to 305 mm (12 inches) on equipment support curbs.

- H. Make size of supports suit size of equipment furnished, with height as shown on construction documents, but not less than 203 mm (8 inches) above roof surface.
- I. Top of Equipment Supports: Level with pitch built into curb when deck slopes. Equip supports with water diverter or cricket on side that obstructs water flow.
- J. Finish: Match Existing or white membrane.

2.4 FINISH:

- A. In accordance with NAAMM AMP 500 Series.
- B. Aluminum, Mill Finish: AA-MIX, as fabricated.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Install roof specialties where indicated on construction documents.
- B. Secure with fasteners in accordance with manufacture's printed installation instructions and approved shop drawings unless shown otherwise.
- C. Coordinate to install insulation where shown; Section 07 22 00, ROOF AND DECK INSULATION.
- D. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions require sealant.
- E. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.
 - 1. After completion of base flashing bend down cap flashing flange and secure to blocking with screws.
 - 2. Install expansion joint cover with 6 mm (1/4 inch) wide space at end joints and tension bars at 610 mm (24 inches) on center.
 - 3. Install cover plates with formed aluminum flashing concealed and centered on joint. Flashing to lap cover not less than 101 mm (4 inches).
- F. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM:

- A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with two (2) coats of asphalt coating (complete coverage), or by separating the contact surfaces with a preformed neoprene tape having pressure sensitive adhesive coating on side.
- B. Paint aluminum in contact with wood, concrete and masonry, or other absorptive materials, that may become repeatedly wet, with two coats of asphalt coating.

3.4 PROTECTION:

- A. Protect roof accessories from damage during installation and after completion of the work from subsequent construction.

- - - E N D - - -

SECTION 07 84 00
FIRESTOPPING

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Provide UL or equivalent approved firestopping system for the closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Provide UL or equivalent approved firestopping system for the closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK:

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Sealants and application: Section 07 92 00, JOINT SEALANTS.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Inspector qualifications.
- E. Manufacturers literature, data, and installation instructions for types of firestopping and smoke stopping used.
- F. List of FM, UL, or WH classification number of systems installed.
- G. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.
- H. Submit certificates from manufacturer attesting that firestopping materials comply with the specified requirements.

1.4 DELIVERY AND STORAGE:

- A. Deliver materials in their original unopened containers with manufacturer's name and product identification.
- B. Store in a location providing protection from damage and exposure to the elements.

1.5 QUALITY ASSURANCE:

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.
- B. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991 or been evaluated by UL and found to comply with UL's "Qualified Firestop Contractor Program Requirements." Submit qualification data.
- C. Inspector Qualifications: Contractor to engage a qualified inspector to perform inspections and final reports. The inspector to meet the criteria contained in ASTM E699 for agencies involved in quality assurance and to have a minimum of two years' experience in construction field inspections of firestopping systems, products, and assemblies. The inspector to be completely independent of, and divested from, the Contractor, the installer, the manufacturer, and the supplier of material or item being inspected. Submit inspector qualifications.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. ASTM International (ASTM):
 - E84-14.....Surface Burning Characteristics of Building Materials
 - E699-09.....Standard Practice for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating of Building Components
 - E814-13a.....Fire Tests of Through-Penetration Fire Stops
 - E2174-14.....Standard Practice for On-Site Inspection of Installed Firestops
 - E2393-10a.....Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers
- C. FM Global (FM):
 - Annual Issue Approval Guide Building Materials
 - 4991-13.....Approval of Firestop Contractors
- D. Underwriters Laboratories, Inc. (UL):
 - Annual Issue Building Materials Directory

Annual Issue Fire Resistance Directory

723-10(2008).....Standard for Test for Surface Burning

Characteristics of Building Materials

1479-04(R2014).....Fire Tests of Through-Penetration Firestops

E. Intertek Testing Services - Warnock Hersey (ITS-WH):

Annual Issue Certification Listings

F. Environmental Protection Agency (EPA):

40 CFR 59(2014).....National Volatile Organic Compound Emission

Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS:

- A. Provide field erected (through-Penetration Firestop Systems) to maintain the required integrity of the fire barrier and stop the passage of gases or smoke. Firestop systems to accommodate building movements without impairing their integrity.
- B. Through-penetration firestop systems and firestop devices tested in accordance with ASTM E814 or UL 1479 using the "F" or "T" rating to maintain the same rating and integrity as the fire barrier being sealed. "T" ratings are not required for penetrations smaller than or equal to 101 mm (4 in.) nominal pipe or 0.01 sq. m (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence are not permitted by VA Fire and Safety for use in firestop systems.
- D. Firestop sealants used for firestopping or smoke sealing to have the following properties:
 - 1. Contain no flammable or toxic solvents.
 - 2. Release no dangerous or flammable out gassing during the drying or curing of products.
 - 3. Water-resistant after drying or curing and unaffected by high humidity, condensation or transient water exposure.
 - 4. When installed in exposed areas, capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials to have following properties:
1. Classified for use with the particular type of penetrating material used.
 2. Penetrations containing loose electrical cables, computer data cables, and communications cables protected using firestopping systems that allow unrestricted cable changes without damage to the seal.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84 or UL 723. Material to be an approved firestopping material as listed in UL Fire Resistance Directory or by a nationally recognized testing laboratory.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.
- H. Materials to be nontoxic and noncarcinogen at all stages of application or during fire conditions and to not contain hazardous chemicals. Provide firestop material that is free from Ethylene Glycol, PCB, MEK, and asbestos.
- I. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 101 mm (4 in.) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means acceptable to the firestop manufacturer.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS:

- A. Provide silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Provide mineral fiber filler and bond breaker behind sealant.

- C. Sealants to have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with ASTM E84.
- D. When used in exposed areas capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Submit product data and installation instructions, as required by article, submittals, after an on-site examination of areas to receive firestopping.
- B. Examine substrates and conditions with installer present for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Remove dirt, grease, oil, laitance and form-release agents from concrete, loose materials, or other substances that prevent adherence and bonding or application of the firestopping or smoke stopping materials.
- B. Remove insulation on insulated pipe for a distance of 150 mm (6 inches) on each side of the fire rated assembly prior to applying the firestopping materials unless the firestopping materials are tested and approved for use on insulated pipes.
- C. Prime substrates where required by joint firestopping system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Apply masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 INSTALLATION:

- A. Do not begin firestopping work until the specified material data and installation instructions of the proposed firestopping systems have been submitted and approved.
- B. Install firestopping systems with smoke stopping in accordance with FM, UL, WH, or other approved system details and installation instructions.
- C. Install smoke stopping seals in smoke partitions.

3.4 CLEAN-UP:

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Clean up spills of liquid type materials.
- C. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.
- D. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to provide firestopping complying with specified requirements.

3.5 INSPECTIONS AND ACCEPTANCE OF WORK:

- A. Do not conceal or enclose firestop assemblies until inspection is complete and approved by the Contracting Officer Representative (COR).
- B. Furnish service of approved inspector to inspect firestopping in accordance with ASTM E2393 and ASTM E2174 for firestop inspection, and document inspection results. Submit written reports indicating locations of and types of penetrations and type of firestopping used at each location; type is to be recorded by UL listed printed numbers.

- - - E N D - - -

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. This section covers interior and exterior sealant and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK (INCLUDING BUT NOT LIMITED TO THE FOLLOWING):

- A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS.
- C. Masonry Control and Expansion Joint: Section 04 20 00, UNIT MASONRY.
- D. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.

1.3 QUALITY ASSURANCE:

- A. Installer Qualifications: An experienced installer with a minimum of three (3) years' experience and who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint-sealant installations with a record of successful in-service performance. Submit qualification.
- B. Source Limitations: Obtain each type of joint sealant through one (1) source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 - 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.

- D. Lab Tests: Submit samples of materials that will be in contact or affect joint sealants to joint sealant manufacturers for tests as follows:
1. Adhesion Testing: Before installing elastomeric sealants, test their adhesion to protect joint substrates according to the method in ASTM C794 to determine if primer or other specific joint preparation techniques are required.
 2. Compatibility Testing: Before installing elastomeric sealants, determine compatibility when in contact with glazing and gasket materials.
 3. Stain Testing: Perform testing per ASTM C1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work is to start until results of these tests have been submitted to the Contracting Officer Representative (COR) and the COR has given written approval to proceed with the work.
- E. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
1. Locate test joints where indicated in construction documents or, if not indicated, as directed by COR.
 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 3. Notify COR seven (7) days in advance of dates and times when test joints will be erected.
 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.

1.4 CERTIFICATION:

- A. Contractor is to submit to the COR written certification that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.

1.5 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Sustainable Design Submittals, as described below:
 - 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
- C. Installer qualifications.
- D. Contractor certification.
- E. Manufacturer's installation instructions for each product used.
- F. Cured samples of exposed sealants for each color.
- G. Manufacturer's Literature and Data:
 - 1. Primers
 - 2. Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- H. Manufacturer warranty.

1.6 PROJECT CONDITIONS:

- A. Environmental Limitations:
 - 1. Do not proceed with installation of joint sealants under following conditions:
 - a. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C (40 degrees F).
 - b. When joint substrates are wet.
- B. Joint-Width Conditions:
 - 1. Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- C. Joint-Substrate Conditions:
 - 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 DELIVERY, HANDLING, AND STORAGE:

- A. Deliver materials in manufacturers' original unopened containers, with brand names, date of manufacture, shelf life, and material designation clearly marked thereon.
- B. Carefully handle and store to prevent inclusion of foreign materials.

- C. Do not subject to sustained temperatures exceeding 32 degrees C (90 degrees F) or less than 5 degrees C (40 degrees F).

1.8 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Backing Rod: A type of sealant backing.
- C. Bond Breakers: A type of sealant backing.
- D. Filler: A sealant backing used behind a back-up rod.

1.9 WARRANTY:

- A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".
- B. Manufacturer Warranty: Manufacturer shall warranty their sealant for a minimum of five (5) years from the date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. ASTM International (ASTM):
 - C509-06.....Elastomeric Cellular Preformed Gasket and Sealing Material
 - C612-14.....Mineral Fiber Block and Board Thermal Insulation
 - C717-14a.....Standard Terminology of Building Seals and Sealants
 - C734-06(R2012).....Test Method for Low-Temperature Flexibility of Latex Sealants after Artificial Weathering
 - C794-10.....Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants
 - C919-12.....Use of Sealants in Acoustical Applications.
 - C920-14a.....Elastomeric Joint Sealants.
 - C1021-08(R2014).....Laboratories Engaged in Testing of Building Sealants
 - C1193-13.....Standard Guide for Use of Joint Sealants.
 - C1248-08(R2012).....Test Method for Staining of Porous Substrate by Joint Sealants
 - C1330-02(R2013).....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants

- C1521-13.....Standard Practice for Evaluating Adhesion of
Installed Weatherproofing Sealant Joints
- D217-10.....Test Methods for Cone Penetration of
Lubricating Grease
- D412-06a(R2013).....Test Methods for Vulcanized Rubber and
Thermoplastic Elastomers-Tension
- D1056-14.....Specification for Flexible Cellular Materials-
Sponge or Expanded Rubber
- E84-09.....Surface Burning Characteristics of Building
Materials
- C. Sealant, Waterproofing and Restoration Institute (SWRI).
The Professionals' Guide
- D. Environmental Protection Agency (EPA):
40 CFR 59(2014).....National Volatile Organic Compound Emission
Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

- A. S-1: NOT USED
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade NS.
 - 5. Shore A hardness of 20-40
- B. S-2: NOT USED
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type M.
 - 3. Class 25.
 - 4. Grade P.
 - 5. Shore A hardness of 25-40.
- C. S-3: NOT USED
 - 1. ASTM C920, polyurethane or polysulfide.
 - 2. Type S.
 - 3. Class 25, joint movement range of plus or minus 50 percent.
 - 4. Grade NS.
 - 5. Shore A hardness of 15-25.
 - 6. Minimum elongation of 700 percent.

D. S-4:

1. ASTM C920 polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-40.

E. S-5:

1. ASTM C920, polyurethane or polysulfide.
2. Type S.
3. Class 25.
4. Grade P.
5. Shore hardness of 15-45.

F. S-6: NOT USED

1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class: Joint movement range of plus 100 percent to minus 50 percent.
4. Grade NS.
5. Shore A hardness of 15-20.
6. Minimum elongation of 1200 percent.

G. S-7: NOT USED

1. ASTM C920, silicone, neutral cure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

H. S-8: NOT USED

1. ASTM C920, silicone, acetoxycure.
2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Structural glazing application.

I. S-9: NOT USED

1. ASTM C920 silicone.
2. Type S.
3. Class 25.

4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

J. S-10: NOT USED

1. ASTM C920, coal tar extended fuel resistance polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 15-20.

K. S-11: NOT USED

1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

L. S-12: NOT USED

1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

2.2 SEALANTS:

A. Exterior Sealants:

1. S-4 Vertical surfaces, provide non-staining ASTM C920, Type S, Grade NS, Class 25, Use NT.
2. S-5 Horizontal surfaces, provide ASTM C920, Type S, Grade P, Class 25, Use T. 3. Provide location(s) of exterior sealant as follows:
 - a. Joints formed where frames and subsills of windows, doors, louvers, and vents adjoin masonry, concrete, or metal frames. Provide sealant at exterior surfaces of exterior wall penetrations.
 - b. Metal to metal.
 - c. Masonry to masonry or stone.
 - d. Masonry expansion and control joints.
 - e. Masonry joints where shelf angles occur.
 - f. Voids where items penetrate exterior walls.

- g. Metal reglets, where flashing is inserted into masonry joints,
and where flashing is penetrated by coping dowels.

2.3 COLOR:

- A. Sealants used with exposed masonry are to match color of mortar joints.
- B. Sealants used with unpainted concrete are to match color of adjacent concrete.
- C. Color of sealants for other locations to be light gray or aluminum, unless otherwise indicated in construction documents.

2.4 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C1330, of type indicated below and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Type C: Closed-cell material with a surface skin.
- C. Elastomeric Tubing Sealant Backings: Neoprene, butyl, EPDM, or silicone tubing complying with ASTM D1056 or synthetic rubber (ASTM C509), nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32 degrees C (minus 26 degrees F). Provide products with low compression set and of size and shape to provide a secondary seal, to control sealant depth, and otherwise contribute to optimum sealant performance.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.5 WEEPS:

- A. Weep/Vent Products: Provide the following unless otherwise indicated or approved.
 - 1. Round Plastic Tubing: Medium-density polyethylene, 10 mm (3/8-inch) OD by thickness of stone or masonry veneer.

2.6 FILLER:

- A. Mineral fiberboard: ASTM C612, Class 1.
- B. Thickness same as joint width.

C. Depth to fill void completely behind back-up rod.

2.7 PRIMER:

- A. As recommended by manufacturer of caulking or sealant material.
- B. Stain free type.

2.8 CLEANERS-NON POROUS SURFACES:

- A. Chemical cleaners compatible with sealant and acceptable to manufacturer of sealants and sealant backing material. Cleaners to be free of oily residues and other substances capable of staining or harming joint substrates and adjacent non-porous surfaces and formulated to promote adhesion of sealant and substrates.

PART 3 - EXECUTION

3.1 INSPECTION:

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI (The Professionals' Guide).
- B. Clean surfaces of joint to receive caulking or sealants leaving joint dry to the touch, free from frost, moisture, grease, oil, wax, lacquer paint, or other foreign matter that would tend to destroy or impair adhesion.
 - 1. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants.
 - 2. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air. Porous joint surfaces include but are not limited to the following:
 - a. Concrete.
 - b. Masonry.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous 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 surfaces include but are not limited to the following:

- a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply non-staining masking tape to face of surfaces adjacent to joints before applying primers, caulking, or sealing compounds.
1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- E. Apply primer to sides of joints wherever required by compound manufacturer's printed instructions or as indicated by pre-construction joint sealant substrate test.
1. Apply primer prior to installation of back-up rod or bond breaker tape.
 2. Use brush or other approved means that will reach all parts of joints. Avoid application to or spillage onto adjacent substrate surfaces.

3.3 BACKING INSTALLATION:

- A. Install backing material, to form joints enclosed on three sides as required for specified depth of sealant.
- B. Where deep joints occur, install filler to fill space behind the backing rod and position the rod at proper depth.
- C. Cut fillers installed by others to proper depth for installation of backing rod and sealants.
- D. Install backing rod, without puncturing the material, to a uniform depth, within plus or minus 3 mm (1/8 inch) for sealant depths specified.
- E. Where space for backing rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.

3.4 SEALANT DEPTHS AND GEOMETRY:

- A. At widths up to 6 mm (1/4 inch), sealant depth equal to width.

- B. At widths over 6 mm (1/4 inch), sealant depth 1/2 of width up to 13 mm (1/2 inch) maximum depth at center of joint with sealant thickness at center of joint approximately 1/2 of depth at adhesion surface.

3.5 INSTALLATION:

A. General:

1. Apply sealants and caulking only when ambient temperature is between 5 degrees C and 38 degrees C (40 degrees and 100 degrees F).
2. Do not install polysulfide base sealants where sealant may be exposed to fumes from bituminous materials, or where water vapor in continuous contact with cementitious materials may be present.
3. Do not install sealant type listed by manufacture as not suitable for use in locations specified.
4. Apply caulking and sealing compound in accordance with manufacturer's printed instructions.
5. Avoid dropping or smearing compound on adjacent surfaces.
6. Fill joints solidly with compound and finish compound smooth.
7. Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 5A in ASTM C1193 unless shown or specified otherwise in construction documents. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Remove any excess sealant from adjacent surfaces of joint, leaving the working in a clean finished condition.
8. Finish paving or floor joints flush unless joint is otherwise detailed.
9. Apply compounds with nozzle size to fit joint width.
10. Test sealants for compatibility with each other and substrate. Use only compatible sealant. Submit test reports.
11. Replace sealant which is damaged during construction process.

- B. Weeps: Place weep holes and vents in joints where moisture may accumulate, including at base of cavity walls, above shelf angles, at all flashing, and as indicated on construction documents.

1. Use round plastic tubing to form weep holes.
2. Space weep holes formed from plastic tubing not more than 406 mm (16 inches) o.c.
3. Trim tubing material used in weep holes flush with exterior wall face after sealant has set.

- C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.

3.6 FIELD QUALITY CONTROL:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 305 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 305 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.
- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated

requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by manufacturer of the adjacent material or if not otherwise indicated by the caulking or sealant manufacturer.
- B. Leave adjacent surfaces in a clean and unstained condition.

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Louis A. Johnson VAMC
Replace Roof Main Building & Clinical Addition
Clarksburg, WV 26301

April 7, 2016
100% Bid Documents
Project No. 540-13-308
04-01-15

SECTION 09 06 00
SCHEDULE FOR FINISHES

SECTION 09 06 00-SCHEDULE FOR FINISHES

VAMC: Louis A. Johnson VA Medical Center
Location: Clarksburg, WV 26301 - 4199
Project no. and Name: 540-13-308 and Replace Roof Main Building & Clinical Addition
Submission 100% Bid Documents
Date: April 7th, 2016

SECTION 09 06 00
SCHEDULE FOR FINISHES

PART I - GENERAL

1.1 DESCRIPTION

This section contains a coordinated system in which requirements for materials specified in other sections shown are identified by abbreviated material names and finish codes in the room finish schedule or shown for other locations.

1.2 MANUFACTURERS

Manufacturer's trade names and numbers used herein are only to identify colors, finishes, textures and patterns. Products of other manufacturer's equivalent to colors, finishes, textures and patterns of manufacturers listed that meet requirements of technical specifications will be acceptable upon approval in writing by contracting officer for finish requirements.

1.3 SUBMITALS

Submit in accordance with SECTION 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES—provide quadruplicate samples for color approval of materials and finishes specified in this section.

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PART 2- PRODUCTS

2.1 DIVISION 04 - MASONRY

A. Section 04 05 13, MASONRY MORTARING

Finish Code	Manufacturer	Mfg. Color Name
Light Brick Mortar, Main Building		Tan
Project Brick Mortar, Main Building		Light Gray
Medical Addition Mortar		Tan

B. Section 04 20 00, UNIT MASONRY

1. FACE BRICK (FB)				
Finish Code	Size	Pattern	Manufacturer	Mfg. Color Name/No.
Light Brick, Main Building	Modular standard	Running Bond	CalStar or Equal	Match Existing; Prairie, Architectural
Project Brick, Main Building	Modular standard	Running Bond or Accent	CalStar or Equal	Match Existing; Maple, Classic
Medical Center Addition Brick	Modular standard	Running Bond	CalStar or Equal	Match Existing; Natural or Almond, Architectural

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C. UNIT MASONRY (04 20 00)

Stone Type	Color	Manufacturer	Mfg. Color & Texture No.
Stone Coping	Existing	Reuse Existing	n/a
Repair Stone Coping	Match Existing		Gray, Weathered to match existing.
Project Stone Bands	Existing	Reuse Existing	N/a

2.2 DIVISION 05 - METALS

A. SECTION 05 31 00, STEEL DECKING, SECTION 05 36 00, COMPOSITE METAL DECKING

Finish	Color
EXPOSED (Above Ceiling/Utility)	GALVANIZED
EXPOSED (Above Ceiling/Utility)	GALVANIZED

B. SECTION 05 50 00, METAL FABRICATION

Item	Finish
Modular Channel Units	Clear Anodized Aluminum
Channel Door Frames	Clear Anodized Aluminum
Edge Guards Angles for Opening in Slabs	SHOP PRIMED
Steel Grating and Frames	Galvanized G90
Aluminum Gratings and Frames	Clear Anodized Aluminum
Steel Plank Gratings	Galvanized G90
Loose Lintels	Galvanized G90
Steel Plate Door Sill	Galvanized G90

Aluminum Plate Door Sill	Clear Anodized Aluminum
Aluminum Safety Nosing	Clear Anodized Aluminum
Steel Ladders	Galvanized G90
Aluminum Ladders	Clear Anodized Aluminum
Steel Ladder Rungs	Galvanized G90
Steel Pipe Railings and Gates (not on Steel Stairs)	Galvanized G90
Aluminum Railings	Clear Anodized Aluminum
Stainless Steel Railings	Exposed Stainless Steel

C. SECTION 07 95 13, EXPANSION JOINT COVER ASSEMBLIES

	Material	Finish	Manufacturer	Mfg. Color Name/No.
Exterior Wall Cover Plate Frame Thermoplastic Joint	Aluminum	Clear Anodized Aluminum	As require to meet Specs.	Clear Anodized Aluminum

2.3 DIVISION 07 - THERMAL AND MOISTURE PROTECTION

A. SETION 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

Color	Manufacturer	Mfg. Color Name/No.
White	As require to meet Specs.	White
Black (Patch)	As require to meet Specs.	Black

B. SECTION 07 56 00, FLUID-APPLIED ROOFING

Material	Color	Manufacturer	Mfg. Color Name/No.
Recovery/Restoration	White	As require to meet Specs.	White

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C. ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING (7 53 23) Accessories

Pavers	Size	Material	Color	Manufacturer	Mfg. Color Name/No.
New	24" x 24"	Reinforced EPDM	White	As require to meet Specs.	White
Replacement	Match Existing	Reinforced EPDM	Black	As require to meet Specs.	Black

D. SECTION 07 60 00, FLASHING AND SHEET METAL

Item	Material	Finish
Copings	Stainless steel	Match Existing Medium Bronze (Stone to be reused)
	Aluminum	
	Stone	
Hanging Gutters and Downspouts	Stainless steel	Match Existing Medium Bronze
	Aluminum	
Roof Insulated Expansion Joint Covers	Aluminum mill	Clear Anodized Aluminum
Roof EPDM Expansion Joint	EDPM	Black
Scuppers	Pre-Finished Aluminum	Match Existing Medium Bronze

E. SECTION 07 71 00 / 07 72 00, ROOF SPECIALTIES AND ACCESSORIES

Item	Material	Finish	Manufacturer	Manufacturer/Color Name/Number.
Roof Hatch	Aluminum	Mill	As require to meet Specs.	Match Existing
Equipment Support	Galv. Steel	Galvanized Steel	As require to meet Specs.	Match Existing
Gravity Ventilators	Aluminum	Mill	As require to meet	Match Existing

			Specs.	
Grating Walkway	Galv Steel	Galvanized Steel	As require to meet Specs.	Match Existing
Copings	Extruded Aluminum	Match Existing Medium Bronze	As require to meet Specs.	Match Existing
Gravel Stops and Fascia System	Extruded Aluminum	Match Existing Medium Bronze	As require to meet Specs.	Match Existing
Fascia Systems	Extruded Aluminum	Match Existing Medium Bronze	As require to meet Specs.	Match Existing
Roof Expansion Joint Covers	Extruded Aluminum	Mill	As require to meet Specs.	Match Existing

F. SECTION 07 92 00, JOINT SEALANTS

Location	Color	Manufacturer	Manufacturer Color
Masonry Expansion Joints in Tan Mortar	Tan	As require to meet Specs.	Match Existing
Masonry Expansion Joints in Light Gray Mortar	Light Gray	As require to meet Specs.	Match Existing
Building Expansion Joints	Black	As require to meet Specs.	Match Existing
Masonry Sealed Joints in Tan Mortar	Tan	As require to meet Specs.	Match Existing
Masonry Sealed Joints in Light Gray Mortar	Light Gray	As require to meet Specs.	Match Existing
Stone Sealed Joints	Light Gray	As require to meet Specs.	Match Existing

2.4 DIVISION 08 - OPENINGS

A. SECTION 08 90 00, LOUVERS AND WALL VENTS

PART III EXECUTION

3.1 FINISH SCHEDULES & MISCELLANEOUS ABBREVIATIONS (TYPICAL; NOT ALL USED IN THE WORK)

FINISH SCHEDULE & MISCELLANEOUS ABBREVIATIONS	
Term	Abbreviation
Access Flooring	AF
Accordion Folding Partition	AFP
Acoustical Ceiling	AT
Acoustical Ceiling, Special Faced	AT (SP)
Acoustical Metal Pan Ceiling	AMP
Acoustical Wall Panel	AWP
Acoustical Wall Treatment	AWT
Acoustical Wallcovering	AWF
Anodized Aluminum Colored	AAC
Anodized Aluminum Natural Finish	AA
Baked On Enamel	BE
Brick Face	BR
Brick Flooring	BF
Brick Paving	BP
Carpet	CP
Carpet Athletic Flooring	CAF
Carpet Module Tile	CPT

Ceramic Glazed Facing Brick	CGFB
Ceramic Mosaic Tile	FTCT
Concrete	C
Concrete Masonry Unit	CMU
Divider Strips Marble	DS MB
Epoxy Coating	EC
Epoxy Resin Flooring	ERF
Existing	E
Exposed Divider Strips	EXP
Exterior	EXT
Exterior Finish System	EFS
Exterior Paint	EXT-P
Exterior Stain	EXT-ST
Fabric Wallcovering	WF
Facing Tile	SCT
Feature Strips	FS
Floor Mats & Frames	FM
Floor Tile, Mosaic	FT
Fluorocarbon	FC
Folding Panel Partition	FP
Foot Grille	FG
Glass Masonry Unit	GUMU
Glazed Face CMU	GCMU
Glazed Structural Facing Tile	SFTU
Granite	GT
Gypsum Wallboard	GWB

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High Glazed Coating	SC
Latex Mastic Flooring	LM
Linear Metal Ceiling	LMC
Linear Wood Ceiling	LWC
Marble	MB
Material	MAT
Mortar	M
Multi-Color Coating	MC
Natural Finish	NF
Paint	P
Paver Tile	PVT
Perforated Metal Facing (Tile or Panels)	PMF
Plaster	PL
Plaster High Strength	HSPL
Plaster Keene Cement	KC
Plastic Laminate	HPDL
Polypropylene Fabric Wallcovering	PFW
Porcelain Paver Tile	PPT
Quarry Tile	QT
Radiant Ceiling Panel System	RCP
Resilient Stair Tread	RST
Rubber Base	RB
Rubber Tile Flooring	RT

Spandrel Glass	SLG
Stain	ST
Stone Flooring	SF
Structural Clay	SC
Suspension Decorative Grids	SDG
Terrazzo Portland Cement	PCT
Terrazzo Tile	TT
Terrazzo, Thin Set	
Textured Gypsum Ceiling Panel	TGC
Textured Metal Ceiling Panel	TMC
Thin set Terrazzo	TST
Veneer Plaster	VP
Vinyl Base	VB
Vinyl Coated Fabric Wallcovering	W
Vinyl Composition Tile	VCT
Vinyl Sheet Flooring	VSF
Vinyl Sheet Flooring (Welded Seams)	WSF
Wall Border	WB
Wood	WD

--- E N D---

REPLACE ROOFS MAIN BUILDING & CLINICAL ADDITION

Project # 540-13-308

For the
Department of Veterans Affairs
Louis A. Johnson VA MC



PROJECT MANUAL

100% Bid Documents

April 7th, 2016



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**SECTION 22 05 11
COMMON WORK RESULTS FOR PLUMBING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section shall apply to all sections of Plumbing connections altered through the course or as part of the project Work.
- B. Definitions:
 - 1. Exposed: Piping and equipment exposed to view.
- C. Abbreviations/Acronyms:
 - 1. ABS: Acrylonitrile Butadiene Styrene
 - 2. AISI: American Iron and Steel Institute
 - 3. AWG: American Wire Gauge
 - 4. BACnet: Building Automation and Control Network
 - 5. BSG: Borosilicate Glass Pipe
 - 6. CDA: Copper Development Association
 - 7. CO: Carbon Monoxide
 - 8. COR: Contracting Officer's Representative
 - 9. CPVC: Chlorinated Polyvinyl Chloride
 - 10. CR: Chloroprene
 - 11. CWP: Cold Working Pressure
 - 12. db(A): Decibels (A weighted)
 - 13. DDC: Direct Digital Control
 - 14. DISS: Diameter Index Safety System
 - 15. DWV: Drainage, Waste and Vent
 - 16. ECC: Engineering Control Center
 - 17. EPDM: Ethylene Propylene Diene Monomer
 - 18. EPT: Ethylene Propylene Terpolymer
 - 19. ETO: Ethylene Oxide
 - 20. FAR: Federal Acquisition Regulations
 - 21. FD: Floor Drain
 - 22. FG: Fiberglass
 - 23. FNPT: Female National Pipe Thread
 - 24. FPM: Fluoroelastomer Polymer
 - 25. HDPE: High Density Polyethylene
 - 26. HOA: Hands-Off-Automatic

- 27. HP: Horsepower
- 28. ID: Inside Diameter
- 29. MAWP: Maximum Allowable Working Pressure
- 30. NPTF: National Pipe Thread Female
- 31. NPS: Nominal Pipe Size
- 32. NPT: National Pipe Thread
- 33. OD: Outside Diameter
- 34. OSD: Open Sight Drain
- 35. OS&Y: Outside Stem and Yoke
- 36. PP: Polypropylene
- 37. PTFE: Polytetrafluoroethylene
- 38. PVC: Polyvinyl Chloride
- 39. PVDF: Polyvinylidene Fluoride
- 40. RTRP: Reinforced Thermosetting Resin Pipe
- 41. SPS: Sterile Processing Services
- 42. SUS: Saybolt Universal Second
- 43. SWP: Steam Working Pressure
- 44. TFE: Tetrafluoroethylene
- 45. THHN: Thermoplastic High-Heat Resistant Nylon Coated Wire
- 46. THWN: Thermoplastic Heat & Water Resistant Nylon Coated Wire
- 47. USDA: U.S. Department of Agriculture
- 48. VAC: Voltage in Alternating Current
- 49. WOG: Water, Oil, Gas

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS.
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- C. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- D. Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.
- E. Section 05 50 00, METAL FABRICATIONS.
- F. Section 07 60 00, FLASHING AND SHEET METAL: Flashing for Wall and Roof Penetrations.
- G. Section 07 84 00, FIRESTOPPING.
- H. Section 07 92 00, JOINT SEALANTS.
- J. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.3 APPLICABLE PUBLICATIONS

- A. The publications listed below shall form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
 - ASME Boiler and Pressure Vessel Code -
 - BPVC Section IX-2013....Welding, Brazing, and Fusing Qualifications
 - B31.1-2012.....Power Piping
- C. American Society for Testing and Materials (ASTM):
 - A36/A36M-2012.....Standard Specification for Carbon Structural Steel
 - A575-96(R2013)e1.....Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
 - E84-2013a.....Standard Test Method for Surface Burning Characteristics of Building Materials
 - E119-2012a.....Standard Test Methods for Fire Tests of Building Construction and Materials
 - F1760-01(R2011).....Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Non-Pressure Plastic Pipe Having Reprocessed-Recycled Content
- D. International Code Council, (ICC):
 - IBC-2012.....International Building Code
 - IPC-2012.....International Plumbing Code
- E. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
 - SP-58-2009.....Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application and Installation
 - SP-69-2003.....Pipe Hangers and Supports - Selection and Application
- F. Military Specifications (MIL):
 - P-21035B.....Paint High Zinc Dust Content, Galvanizing Repair (Metric)
- G. National Electrical Manufacturers Association (NEMA):
 - MG 1-2011.....Motors and Generators

- H. National Fire Protection Association (NFPA):
 - 51B-2014.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work
 - 54-2012.....National Fuel Gas Code
 - 70-2011.....National Electrical Code (NEC)
- I. NSF International (NSF):
 - 5-2012.....Water Heaters, Hot Water Supply Boilers, and
Heat Recovery Equipment
 - 14-2012.....Plastic Piping System Components and Related
Materials
 - 61-2012.....Drinking Water System Components - Health
Effects
 - 372-2011.....Drinking Water System Components - Lead Content
- J. Department of Veterans Affairs (VA):
 - PG-18-10.....Plumbing Design Manual
 - PG-18-13-2011.....Barrier Free Design Guide

1.4 SUBMITTALS

- A. Submittals, including number of required copies, shall be submitted in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Information and material submitted under this section shall be marked "SUBMITTED UNDER SECTION 22 05 11, COMMON WORK RESULTS FOR PLUMBING", with applicable paragraph identification.
- C. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements and will fit the space available.
- D. If equipment is submitted which differs in arrangement from that shown, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.
- E. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

- F. Installing Contractor shall provide lists of previous installations for selected items of equipment. Contact persons who will serve as references, with telephone numbers and e-mail addresses shall be submitted with the references.
- G. Manufacturer's Literature and Data: Manufacturer's literature shall be submitted under the pertinent section rather than under this section.
1. Electric motor data and variable speed drive data shall be submitted with the driven equipment.
 2. Equipment and materials identification.
 3. Firestopping materials.
 4. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
 5. Wall, floor, and ceiling plates.
- H. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only by groups.
- I. Coordination Drawings: Complete consolidated and coordinated layout drawings shall be submitted for existing systems that are in the same areas. The drawings shall include plan views of all systems and shall be on a scale of not less than 1:32 (3/8 inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show the proposed location and adequate clearance for all equipment, controls, piping, pumps, valves and other items. Equipment supports with penetrations shall not be installed until equipment or piping layout drawings have been approved. In addition, details of the following shall be provided.
1. Hangers, inserts, supports, and bracing.
 2. Equipment penetrations of floors, walls, ceilings, or roofs.
- J. Maintenance Data and Operating Instructions:
1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment. Include complete list indicating all components of the systems with diagrams of the internal wiring for each item of equipment.

2. Include listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment shall be provided. The listing shall include belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

1.5 QUALITY ASSURANCE

A. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture, supply and servicing of the specified products for at least 5 years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least 5 years.
2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
3. Local codes and amendments enforced by the local code official shall be enforced, if required by local authorities such as the natural gas supplier. If the local codes are more stringent, then the local code shall apply. Any conflicts shall be brought to the attention of the Contracting Officers Representative (COR).
4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
7. Asbestos products or equipment or materials containing asbestos shall not be used.

B. Welding: Before any welding is performed, contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".

2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 3. Certify that each welder and welding operator has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
 4. All welds shall be stamped according to the provisions of the American Welding Society.
- C. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the COR prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.
- D. Execution (Installation, Construction) Quality:
1. All items shall be applied and installed in accordance with manufacturer's written instructions. Conflicts between the manufacturer's instructions and the contract documents shall be referred to the COR for resolution. Printed copies or electronic files of manufacturer's installation instructions shall be provided to the COR at least 10 working days prior to commencing installation of any item.
 2. All items that require access, such as for operating, cleaning, servicing, maintenance, and calibration, shall be easily and safely accessible by persons standing at roof level, or standing on permanent platforms, without the use of portable ladders. Examples of these items include, but are not limited to: all types of valves, transmitters, and control devices. Prior to commencing installation work, refer conflicts between this requirement and contract documents to COR for resolution.
 3. Complete layout drawings shall be required by Paragraph, SUBMITTALS. Construction work shall not start on any system until the layout drawings have been approved by VA.
 4. Installer Qualifications: Installer shall be licensed and shall provide evidence of the successful completion of at least five

- projects of equal or greater size and complexity. Provide tradesmen skilled in the appropriate trade.
5. If an installation is unsatisfactory to the COR, the Contractor shall correct the installation at no additional cost or additional time to the Government.
- E. Guaranty: Warranty of Construction, FAR clause 52.246-21.
- F. Plumbing Systems: IPC, International Plumbing Code. Unless otherwise required herein, perform plumbing work in accordance with the latest version of the IPC. For IPC codes referenced in the contract documents, advisory provisions shall be considered mandatory, the word "should" shall be interpreted as "shall". Reference to the "code official" or "VA - COR" shall be interpreted to mean the COR.
- G. Cleanliness of Piping and Equipment Systems:
1. Care shall be exercised in the storage and handling of equipment and piping material to be incorporated in the work. Debris arising from cutting, threading and welding of piping shall be removed.
 2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
 3. The interior of all tanks shall be cleaned prior to delivery and beneficial use by the Government. All piping shall be tested in accordance with the specifications and the International Plumbing Code (IPC). All filters, strainers, fixture faucets shall be flushed of debris prior to final acceptance.
 4. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Protection of Equipment:
1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 2. Damaged equipment shall be replaced with an identical unit as determined and directed by the COR. Such replacement shall be at no additional cost or additional time to the Government.

3. Interiors of new equipment and piping systems shall be protected against entry of foreign matter. Both inside and outside shall be cleaned before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

1.7 AS-BUILT DOCUMENTATION

- A. Submit manufacturer's literature and data updated to include submittal review comments and any equipment substitutions.
- B. Submit operation and maintenance data updated to include any new or replaced products shall be inserted into a three ring binder. All aspects of system operation and maintenance procedures, including piping isometrics, wiring diagrams of all circuits, a written description of system design, control logic, and sequence of operation shall be included in the operation and maintenance manual. The operations and maintenance manual shall include troubleshooting techniques and procedures for emergency situations. Information explaining any special knowledge or tools the VA - COR will be required to employ shall be inserted into the As-Built documentation.
- C. The installing contractor shall maintain as-built drawings for verification; and, shall provide the complete set at the time of final systems certification testing. As-built drawings are to be provided, and a copy of them on Auto-Cad version 2012 provided on compact disk or DVD. Should the installing contractor engage the testing company to provide as-built or any portion thereof, it shall not be deemed a conflict of interest or breach of the 'third party testing company' requirement.
- D. Certification documentation shall be provided prior to submitting the request for final inspection. The documentation shall include all test results, the names of individuals performing work for the testing agency on this project, detailed procedures followed for all tests, and a certification that all results of tests were within limits specified.

PART 2 - PRODUCTS

2.1 MATERIALS FOR VARIOUS SERVICES

- A. Non-pressure PVC pipe shall contain a minimum of 25 percent recycled content. Steel pipe shall contain a minimum of 25 percent recycled content.

- B. Plastic pipe, fittings and solvent cement shall meet NSF 14 and shall bear the NSF seal "NSF-PW". Polypropylene pipe and fittings shall comply with NSF 14 and NSF 61. Solder or flux containing lead shall not be used with copper pipe.
- C. Material or equipment containing a weighted average of greater than 0.25 percent lead shall not be used in any potable water system intended for human consumption, and shall be certified in accordance with NSF 61 or NSF 372.
- D. In-line devices such as water meters, building valves, check valves, stops, valves, fittings, tanks and backflow preventers shall comply with NSF 61 and NSF 372.

2.2 FACTORY-ASSEMBLED PRODUCTS

- A. Standardization of components shall be maximized to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly at no additional cost or time to the Government.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.
- D. Major items of equipment, which serve the same function, shall be the same make and model.

2.3 COMPATIBILITY OF RELATED EQUIPMENT

- A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational system that conforms to contract requirements.

2.4 SAFETY GUARDS

- A. Pump shafts and couplings shall be fully guarded by a sheet steel guard, covering coupling and shaft but not bearings. Material shall be minimum 16-gage sheet steel; ends shall be braked and drilled and attached to pump base with minimum of four 8 mm (1/4 inch) bolts. Reinforce guard as necessary to prevent side play forcing guard onto couplings.
- B. All Equipment shall have moving parts protected from personal injury.

2.5 LIFTING ATTACHMENTS

- A. Equipment shall be provided with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

2.8 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings, or shown in the maintenance manuals. Coordinate equipment and valve identification with facility maintenance staff. In addition, provide bar code identification nameplate for all equipment which will allow the equipment identification code to be scanned into the system for maintenance and inventory tracking. Identification for piping is specified in Section 09 91 00, PAINTING.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 7 mm (3/16 inch) high riveted or bolted to the equipment.
- D. Control Items: All temperature, pressure, and controllers shall be labeled and the component's function identified. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
 - 1. Plumbing: All valves shall be provided with valve tags and listed on a valve list (Fixture stops not included).
 - 2. Valve tags: Engraved black filled numbers and letters not less than 15 mm (1/2 inch) high for number designation, and not less than 8 mm (1/4 inch) for service designation on 19 gage, 40 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.

3. Valve lists: Valve lists shall be created using a word processing program and printed on plastic coated cards. The plastic coated valve list card(s), sized 215 mm (8-1/2 inches) by 275 mm (11 inches) shall show valve tag number, valve function and area of control for each service or system. The valve list shall be in a punched 3-ring binder notebook. An additional copy of the valve list shall be mounted in picture frames for mounting to a wall. COR shall instruct contractor where frames shall be mounted.
4. A detailed plan for each floor of the building indicating the location and valve number for each valve shall be provided in the 3-ring binder notebook. Each valve location shall be identified with a color coded sticker or thumb tack in ceiling or access door.

2.9 FIRESTOPPING

- A. Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping.

2.10 GALVANIZED REPAIR COMPOUND

- A. Mil. Spec. DOD-P-21035B, paint.

2.11 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. In lieu of the paragraph which follows, suspended equipment support and restraints may be designed and installed in accordance with the International Building Code (IBC Submittals based on the International Building Code (IBC requirements, or the following paragraphs of this Section shall be stamped and signed by a professional engineer registered in the state where the project is located. The Support system of suspended equipment over 227 kg (500 pounds) shall be submitted for approval of the COR in all cases. See the above specifications for lateral force design requirements.
- B. Type Numbers Specified: For materials, design, manufacture, selection, application, and installation refer to MSS SP-58. For selection and application refer to MSS SP-69. Refer to Section 05 50 00, METAL FABRICATIONS, for miscellaneous metal support materials and prime coat painting.
- C. For Attachment to Concrete Construction:
 1. Concrete insert: Type 18, MSS SP-58.

2. Self-drilling expansion shields and machine bolt expansion anchors:
Permitted in concrete not less than 100 mm (4 inches) thick when approved by the COR for each job condition.
 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 100 mm (4 inches) thick when approved by the COR for each job condition.
- D. For Attachment to Steel Construction: MSS SP-58.
1. Welded attachment: Type 22.
 2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23 mm (7/8 inch) outside diameter.
- E. Hanger Rods: Hot-rolled steel, ASTM A36/A36M or ASTM A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 40 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.
- F. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 43 mm by 43 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts.
1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 8 mm (1/4 inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 15 mm (1/2 inch) galvanized steel bands, or insulated calcium silicate shield for insulated piping at each hanger.
- G. Pipe Hangers and Supports: (MSS SP-58), use hangers sized to encircle insulation on insulated piping. Refer to Section 22 07 11, PLUMBING INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or insulated calcium silicate shields. Provide Type 40 insulation shield or insulated calcium silicate shield at all other types of supports and hangers including those for insulated piping.
1. General Types (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.
 - d. Roller supports: Type 41, 43, 44 and 46.

- e. Saddle support: Type 36, 37 or 38.
 - f. Turnbuckle: Types 13 or 15.
 - g. U-bolt clamp: Type 24.
 - h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, copper-coated, plastic coated or taped with isolation tape to prevent electrolysis.
 - 2) For vertical runs use epoxy painted, copper-coated or plastic coated riser clamps.
 - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
 - 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
 - i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp. Spring Supports (Expansion and contraction of vertical piping):
 - 1) Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2) Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
 - j. Spring hangers are required on all plumbing system pumps one horsepower and greater.
2. Plumbing Piping (Other Than General Types):
- a. Horizontal piping: Type 1, 5, 7, 9, and 10.
 - b. Chrome plated piping: Chrome plated supports.
 - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
 - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.

J. Pre-insulated Calcium Silicate Shields:

1. Provide 360 degree water resistant high density 965 kPa (140 psig) compressive strength calcium silicate shields encased in galvanized metal.
2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
3. Shield thickness shall match the pipe insulation.
4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. Shields for supporting cold water shall have insulation that extends a minimum of 25 mm (1 inch) past the sheet metal.
 - b. The insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS SP-69. To support the load, the shields shall have one or more of the following features: structural inserts 4138 kPa (600 psig) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36/A36M) wear plates welded to the bottom sheet metal jacket.
5. Shields may be used on steel clevis hanger type supports, trapeze hangers, roller supports or flat surfaces.

K. Seismic Restraint of Piping: Refer to Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

2.12 PIPE PENETRATIONS

- A. Pipe penetration sleeves shall be installed for all pipe other than rectangular blocked out floor openings for risers in mechanical bays.
- B. Pipe penetration sleeve materials shall comply with all firestopping requirements for each penetration.
- C. To prevent accidental liquid spills from passing to a lower level, provide the following:
 1. For sleeves: Extend sleeve 50 mm (2 inch) above finished floor and provide sealant for watertight joint.
 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- D. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges, with structural engineer prior

approval. Any deviation from these requirements must receive prior approval of COR.

- E. Sheet metal, plastic, or moisture resistant fiber sleeves shall be provided for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- F. Cast iron or zinc coated pipe sleeves shall be provided for pipe passing through exterior walls below grade. The space between the sleeve and pipe shall be made watertight with a modular or link rubber seal. The link seal shall be applied at both ends of the sleeve.
- G. Galvanized steel or an alternate black iron pipe with asphalt coating sleeves shall be for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. A galvanized steel sleeve shall be provided for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, sleeves shall be connected with a floor plate.
- H. Brass Pipe Sleeves shall be provided for pipe passing through quarry tile, terrazzo or ceramic tile floors. The sleeve shall be connected with a floor plate.
- I. Sleeve clearance through floors, walls, partitions, and beam flanges shall be 25 mm (1 inch) greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation plus 25 mm (1 inch) in diameter. Interior openings shall be caulked tight with firestopping material and sealant to prevent the spread of fire, smoke, water and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS. Bio-based materials shall be utilized when possible.
- K. Pipe passing through roof shall be installed through a 4.9 kg per square meter copper flashing with an integral skirt or flange. Skirt or flange shall extend not less than 200 mm (8 inches) from the pipe and set in a solid coating of bituminous cement. Extend flashing a minimum of 250 mm (10 inches) up the pipe. Pipe passing through a waterproofing membrane shall be provided with a clamping flange. The annular space between the sleeve and pipe shall be sealed watertight.

2.13 TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the COR, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Tool Containers: metal, permanently identified for intended service and mounted, or located, where directed by the COR.
- D. Lubricants: A minimum of 0.95 L (1 quart) of oil, and 0.45 kg (1 pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application. Bio-based materials shall be utilized when possible.

2.14 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025 inch) for up to 75 mm (3 inch) pipe, 0.89 mm (0.035 inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Wall plates shall be used where insulation ends on exposed water supply pipe drop from overhead. A watertight joint shall be provided in spaces where brass or steel pipe sleeves are specified.

2.15 ASBESTOS

- A. Materials containing asbestos are not permitted.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Location of piping, sleeves, inserts, hangers, and equipment, access provisions shall be coordinated with the work of all trades. Piping, sleeves, inserts, hangers, and equipment shall be located clear of windows, doors, openings, light outlets, and other services and utilities.
- B. Manufacturer's published recommendations shall be followed for installation methods not otherwise specified.

- C. Operating Personnel Access and Observation Provisions: All equipment and systems shall be arranged to provide clear view and easy access, without use of portable ladders, for maintenance, testing and operation of all devices including, but not limited to: all equipment items, valves, transmitters, sensors, meters and control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Maintenance and operating space and access provisions that are shown on the drawings shall not be changed nor reduced.
- D. Structural systems necessary for pipe and equipment support shall be coordinated to permit proper installation.
- E. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- F. Cutting Holes:
1. Holes shall be located to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
 2. Waterproof membrane shall not be penetrated. Pipe floor penetration block outs shall be provided outside the extents of the waterproof membrane.
 3. Holes through concrete and masonry shall be cut by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by COR where working area space is limited.
- G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- H. Protection and Cleaning:
1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the COR. Damaged or defective items in the opinion of the COR, shall be replaced at no additional cost or time to the Government.

2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Pipe openings, equipment, and plumbing fixtures shall be tightly covered against dirt or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- I. Gages, thermometers, valves and other devices shall be installed with due regard for ease in reading or operating and maintaining said devices. Thermometers and gages shall be located and positioned to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
 - J. Interconnection of Electrical Instrumentation and Controls: Electrical interconnection is generally not shown but shall be provided. This includes interconnections of sensors, transmitters, transducers, control devices, control and instrumentation panels, alarms, instruments and computer workstations. Comply with NFPA 70.
 - K. Work in Existing Building:
 1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).
 2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will cause the least interfere with normal operation of the facility.
 - L. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above data equipment, and electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Drain valve shall be provided in low point of casement pipe.
 - M. Inaccessible Equipment:
 1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action

- performed as directed at no additional cost or additional time to the Government.
2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as electrical conduit, motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities may require temporary installation or relocation of equipment and piping. Temporary equipment or pipe installation or relocation shall be provided to maintain continuity of operation of existing facilities.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain, operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities. The requirements of paragraph 3.1 shall apply.
- C. Temporary facilities and piping shall be completely removed back to the nearest active distribution branch or main pipe line and any openings in structures sealed. Dead legs are not allowed in potable water systems. Necessary blind flanges and caps shall be provided to seal open piping remaining in service.

3.3 RIGGING

- A. Openings in building structures shall be planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered and will be considered by Government under specified restrictions of phasing and service requirements as well as structural integrity of the building.
- C. All openings in the building shall be closed when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility.

- E. Contractor shall check all clearances, weight limitations and shall provide a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Rigging plan and methods shall be referred to COR for evaluation prior to actual work.

3.4 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Holes shall be drilled or burned in structural steel ONLY with the prior written approval of the COR.
- B. The use of chain pipe supports, wire or strap hangers; wood for blocking, stays and bracing, or hangers suspended from piping above shall not be permitted. Rusty products shall be replaced.
- C. Hanger rods shall be used that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. A minimum of 15 mm (1/2 inch) clearance between pipe or piping covering and adjacent work shall be provided.
- D. For horizontal and vertical plumbing pipe supports, refer to the International Plumbing Code (IPC) and these specifications.
- E. Overhead Supports:
 - 1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 - 2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
 - 3. Tubing and capillary systems shall be supported in channel troughs.
- F. Floor Supports:
 - 1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Concrete bases and structural systems shall be anchored and doweled to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 - 2. Bases and supports shall not be located and installed until equipment mounted thereon has been approved. Bases shall be sized to

- match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Structural drawings shall be reviewed for additional requirements. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.
3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a grout material to permit alignment and realignment.
 4. For seismic anchoring, refer to Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

3.5 LUBRICATION

- A. All equipment and devices requiring lubrication shall be lubricated prior to initial operation. All devices and equipment shall be field checked for proper lubrication.
- B. All devices and equipment shall be equipped with required lubrication fittings. A minimum of one liter (one quart) of oil and 0.45 kg (1 pound) of grease of manufacturer's recommended grade and type for each different application shall be provided. All materials shall be delivered to COR in unopened containers that are properly identified as to application.
- C. A separate grease gun with attachments for applicable fittings shall be provided for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.
- E. All lubrication points shall be extended to one side of the equipment.

3.6 PLUMBING SYSTEMS DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided after approval for structural integrity by the COR. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, approved protection from dust and debris shall be provided at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating plant, cleanliness and safety shall be maintained. The plant shall be kept in an operating condition. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Work shall be confined to the immediate area concerned; maintain cleanliness and wet down

demolished materials to eliminate dust. Dust and debris shall not be permitted to accumulate in the area to the detriment of plant operation. All flame cutting shall be performed to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. All work shall be performed in accordance with recognized fire protection standards including NFPA 51B. Inspections will be made by personnel of the VA Medical Center, and the Contractor shall follow all directives of the COR with regard to rigging, safety, fire safety, and maintenance of operations.

- C. Unless specified otherwise, all piping, wiring, conduit, and other devices associated with the equipment not re-used in the new work shall be completely removed from Government property per Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT. This includes all unused or abandoned equipment pads, pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. All openings shall be sealed after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and specifications of the other disciplines in the project for additional facilities to be demolished or handled.
- D. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Government property and shall be removed and delivered to COR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate. Coordinate with the COR and Infection Control.

3.7 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned.
- B. In addition, the following special conditions apply:
1. Cleaning shall be thorough. Solvents, cleaning materials and methods recommended by the manufacturers shall be used for the specific

- tasks. All rust shall be removed prior to painting and from surfaces to remain unpainted. Scratches, scuffs, and abrasions shall be repaired prior to applying prime and finish coats.
2. The following Material and Equipment shall NOT be painted:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gages and thermometers.
 - j. Glass.
 - k. Name plates.
 3. Control and instrument panels shall be cleaned and damaged surfaces repaired. Touch-up painting shall be made with matching paint type and color obtained from manufacturer or computer matched.
 4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same paint type and color as utilized by the pump manufacturer.
 5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats per Section 09 91 00, Painting.
 6. The final result shall be a smooth, even-colored, even-textured factory finish on all items. The entire piece of equipment shall be repainted, if necessary, to achieve this. Lead based paints shall not be used.

3.8 IDENTIFICATION SIGNS

- A. Laminated plastic signs, with engraved lettering not less than 7 mm (3/16 inch) high, shall be provided that designates equipment function, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.

- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, and performance data shall be placed on factory built equipment.
- C. Pipe Identification: Refer to Section 09 91 00, PAINTING.

3.9 STARTUP AND TEMPORARY OPERATION

- A. Startup of equipment shall be performed as described in the equipment specifications. Vibration within specified tolerance shall be verified prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

- - - E N D - - -

**SECTION 23 05 11
COMMON WORK RESULTS FOR HVAC**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The requirements of this Section apply to all sections of Division 23.
- B. Definitions:
 - 1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
 - 2. Option or optional: Contractor's choice of an alternate material or method.
 - 3. RE: COR
 - 4. COTR: Contracting Officer's Technical Representative.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS
- B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES
- C. Section 05 50 00, METAL FABRICATIONS
- D. Section 07 84 00, FIRESTOPPING
- E. Section 07 92 00, JOINT SEALANTS
- F. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS

1.3 QUALITY ASSURANCE

- A. Mechanical, electrical and associated systems shall be safe, reliable, efficient, durable, easily and safely operable and maintainable, easily and safely accessible, and in compliance with applicable codes as specified. The systems shall be comprised of high quality institutional-class and industrial-class products of manufacturers that are experienced specialists in the required product lines. All construction firms and personnel shall be experienced and qualified specialists in industrial and institutional HVAC
- B. Equipment Vibration Tolerance:
 - 1. Equipment shall be factory-balanced to this tolerance and re-balanced on site, as necessary.
 - 2. After HVAC air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the manufacturers vibration tolerance and recommendation.
- D. Products Criteria:

1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years (or longer as specified elsewhere). The design, model and size of each item shall have been in satisfactory and efficient operation on at least three installations for approximately three years. However, digital electronics devices, software and systems such as controls, instruments, computer work station, shall be the current generation of technology and basic design that has a proven satisfactory service record of at least three years. See other specification sections for any exceptions and/or additional requirements.
 2. All items furnished shall be free from defects that would adversely affect the performance, maintainability and appearance of individual components and overall assembly.
 3. Conform to codes and standards as required by the specifications. Conform to local codes, if required by local authorities such as the natural gas supplier, if the local codes are more stringent than those specified. Refer any conflicts to the COR.
 4. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
 5. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
 6. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
 7. Asbestos products or equipment or materials containing asbestos shall not be used.
- E. Equipment Service Organizations:
1. HVAC: Products and systems shall be supported by service organizations that maintain a complete inventory of repair parts and are located within 50 miles to the site.
- F. HVAC Mechanical Systems Welding: Before any welding is performed on new or existing systems, contractor shall submit a certificate certifying that welders comply with the following requirements:

1. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".
 2. Comply with provisions of ASME B31 series "Code for Pressure Piping".
 3. Certify that each welder has passed American Welding Society (AWS) qualification tests for the welding processes involved, and that certification is current.
- G. Execution (Installation, Construction) Quality:
1. Apply and install all items in accordance with manufacturer's written instructions. Refer conflicts between the manufacturer's instructions and the contract drawings and specifications to the COR for resolution. Provide written hard copies or computer files of manufacturer's installation instructions to the COR at least two weeks prior to commencing installation of any item. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations is a cause for rejection of the material.
 2. Provide complete layout drawings required by Paragraph, SUBMITTALS. Do not commence construction work on any system until the layout drawings have been approved.
- H. Upon request by Government, provide lists of previous installations for selected items of equipment. Include contact persons who will serve as references, with telephone numbers and e-mail addresses.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, and with requirements in the individual specification sections.
- B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.
- C. If equipment is submitted which differs in arrangement from the existing, provide certified drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract.

- D. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.
- E. Submittals and shop drawings for interdependent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient system.
- H. Layout Drawings:
1. Submit complete consolidated and coordinated layout drawings for all new systems, and for existing systems that are in the same areas.
 2. The drawings shall include plan views of any systems that shall be new, replaced or reinstalled and shall be on a scale of not less than 1:32 (3/8-inch equal to one foot). Clearly identify and dimension the proposed locations of the principal items of equipment. The drawings shall clearly show locations and adequate clearance for all equipment, piping, valves, control panels and other items. Show the access means for all items requiring access for operations and maintenance. Provide detailed layout drawings of all piping and duct systems.
 3. Do not disconnect, remove or install equipment foundations, equipment or piping until layout drawings have been approved.
 4. In addition, for HVAC systems, provide details of the following:
 - a. Hangers, inserts, supports, and bracing.
 - b. Pipe sleeves and wall/roof penetrations.
 - c. Duct or equipment penetrations of walls, or roofs.
- I. Manufacturer's Literature and Data: Mark the submittals, "SUBMITTED FOR HVAC REPAIRS/REPLACEMENTS".
1. Submit belt drive with all adjusted driven equipment. Submit selection data for specific drives.
 2. Submit electric motor data and variable speed drive data with the driven equipment that is replaced or reinstalled.
 3. Equipment and materials identification.
 4. Fire-stopping materials.

5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.

6. Wall, floor, and ceiling plates.

J. HVAC Maintenance Data and Operating Instructions:

1. Maintenance and operating manuals in accordance with Section 01 00 00, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for new or replaced systems and equipment. Coordinate access to VA - COR's/VA Maintenance Data and Operating Instructions with COR for Reinstalled or adjusted systems.

2. Provide a listing of replaced parts for keeping in stock supply. Include sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.

1.5 APPLICABLE PUBLICATIONS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.

B. Air Conditioning, Heating and Refrigeration Institute (AHRI):
430-2009.....Central Station Air-Handling Units

C. American National Standard Institute (ANSI):
B31.1-2007.....Power Piping

D. Rubber Manufacturers Association (ANSI/RMA):
IP-20-2007.....Specifications for Drives Using Classical
V-Belts and Sheaves
IP-21-2009.....Specifications for Drives Using Double-V
(Hexagonal) Belts
IP-22-2007.....Specifications for Drives Using Narrow V-Belts
and Sheaves

E. Air Movement and Control Association (AMCA):
410-96.....Recommended Safety Practices for Air Moving
Devices

F. American Society of Mechanical Engineers (ASME):
Boiler and Pressure Vessel Code (BPVC):
Section I-2007.....Power Boilers
Section IX-2007.....Welding and Brazing Qualifications
Code for Pressure Piping:
B31.1-2007.....Power Piping

G. American Society for Testing and Materials (ASTM):

A36/A36M-08.....Standard Specification for Carbon Structural
Steel

A575-96(2007).....Standard Specification for Steel Bars, Carbon,
Merchant Quality, M-Grades

E84-10.....Standard Test Method for Surface Burning
Characteristics of Building Materials

E119-09c.....Standard Test Methods for Fire Tests of
Building Construction and Materials

H. Manufacturers Standardization Society (MSS) of the Valve and Fittings
Industry, Inc:

SP-58-2009.....Pipe Hangers and Supports-Materials, Design and
Manufacture, Selection, Application, and
Installation

SP 69-2003.....Pipe Hangers and Supports-Selection and
Application

SP 127-2001.....Bracing for Piping Systems, Seismic - Wind -
Dynamic, Design, Selection, Application

I. National Electrical Manufacturers Association (NEMA):

MG-1-2009.....Motors and Generators

J. National Fire Protection Association (NFPA):

31-06.....Standard for Installation of Oil-Burning
Equipment

54-09.....National Fuel Gas Code

70-08.....National Electrical Code

85-07.....Boiler and Combustion Systems Hazards Code

90A-09.....Standard for the Installation of Air
Conditioning and Ventilating Systems

101-09.....Life Safety Code

1.6 DELIVERY, STORAGE AND HANDLING

A. Protection of Equipment:

1. Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Government has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.

2. Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the COR. Such repair or replacement shall be at no additional cost to the Government.
3. Protect interiors of equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
4. Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

B. Cleanliness of Piping and Equipment Systems:

1. Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
2. Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
3. Clean interior of all tanks prior to delivery for beneficial use by the Government.
4. Boilers shall be left clean following final internal inspection by Government insurance representative or inspector.
5. Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.7 JOB CONDITIONS - WORK IN EXISTING BUILDING

- A. Building Operation: Government employees will be continuously operating and managing all facilities, including temporary facilities that serve the medical center.
- B. Maintenance of Service: Schedule all work to permit continuous service as required by the medical center.
- C. Steam and Condensate Service Interruptions: Limited steam and condensate service interruptions, as required for interconnections of new and existing systems, will be permitted by the COR during periods when the demands are not critical to the operation of the medical center. These non-critical periods are limited to between 8 pm and 5 am in the appropriate off-season (if applicable). Provide at least one week advance notice to the COR.
- D. Phasing of Work: Comply with all requirements shown on drawings or specified.

- E. Building Working Environment: Maintain the architectural and structural integrity of the building and the working environment at all times. Maintain the interior of building at 18 degrees C (65 degrees F) minimum. Limit the opening of doors, windows or other access openings to brief periods as necessary for rigging purposes. No storm water or ground water leakage permitted. Provide daily clean-up of construction and demolition debris on all floor surfaces and on all equipment being operated by VA.
- F. Acceptance of Work for Government Operation: As new facilities are made available for operation and these facilities are of beneficial use to the Government, inspections will be made and tests will be performed. Based on the inspections, a list of contract deficiencies will be issued to the Contractor. After correction of deficiencies as necessary for beneficial use, the Contracting Officer will process necessary acceptance and the equipment will then be under the control and operation of Government personnel.

PART 2 - PRODUCTS

2.1 FACTORY-ASSEMBLED PRODUCTS

- A. Provide maximum standardization of components to reduce spare part requirements.
- B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.
 - 1. All components of an assembled unit need not be products of same manufacturer.
 - 2. Constituent parts that are alike shall be products of a single manufacturer.
 - 3. Components shall be compatible with each other and with the total assembly for intended service.
 - 4. Contractor shall guarantee performance of assemblies of components, and shall repair or replace elements of the assemblies as required to deliver specified performance of the complete assembly.
- C. Components of equipment shall bear manufacturer's name and trademark, model number, serial number and performance data on a name plate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

- D. Major items of equipment, which serve the same function, must be the same make and model. Exceptions will be permitted if performance requirements cannot be met.

2.2 COMPATIBILITY OF RELATED EQUIPMENT

Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that the result will be a complete and fully operational plant that conforms to contract requirements.

2.8 EQUIPMENT AND MATERIALS IDENTIFICATION

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and shown in the maintenance manuals. Identification for piping is specified in Section 09 91 00, PAINTING.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 48 mm (3/16-inch) high riveted or bolted to the equipment.
- D. Control Items: Label all temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.
- E. Valve Tags and Lists:
1. HVAC and Boiler Plant: Provide for all valves
 2. Valve tags: Engraved black filled numbers and letters not less than 13 mm (1/2-inch) high for number designation, and not less than 6.4 mm(1/4-inch) for service designation on 19 gage 38 mm (1-1/2 inches) round brass disc, attached with brass "S" hook or brass chain.
 3. Valve lists: Typed or printed plastic coated card(s), sized 216 mm(8-1/2 inches) by 280 mm (11 inches) showing tag number, valve function and area of control, for each service or system. Punch sheets for a 3-ring notebook.
 4. Provide detailed plan for each floor of the building indicating the location and valve number for each valve. Identify location of each valve with a color coded thumb tack in ceiling.

2.9 FIRESTOPPING

Section 07 84 00, FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork.

2.10 GALVANIZED REPAIR COMPOUND

Mil. Spec. DOD-P-21035B, paint form.

2.11 HVAC PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS

- A. Vibration Isolators: Reuse or provide isolators to match existing. New shall meet Manufacturers recommendations.
- B. Supports for Roof Mounted Items:
 - 1. Equipment: Equipment rails shall be galvanized steel, minimum 1.3 mm (18 gauge), with integral baseplate, continuous welded corner seams, factory installed 50 mm by 100 mm (2 by 4) treated wood nailer, 1.3 mm (18 gauge) galvanized steel counter flashing cap with screws, built-in cant strip, (except for gypsum or tectum deck), minimum height 280 mm (11 inches). For surface insulated roof deck, provide raised cant strip to start at the upper surface of the insulation.
 - 2. Pipe/duct pedestals: Provide a galvanized Unistrut channel welded to U-shaped mounting brackets which are secured to side of rail with galvanized lag bolts.
- C. Pipe Supports: Comply with MSS SP-58. Type Numbers specified refer to this standard. For selection and application comply with MSS SP-69.
- D. Attachment to Concrete Building Construction:
 - 1. Concrete insert: MSS SP-58, Type 18.
 - 2. Self-drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (four inches) thick when approved by the COR for each job condition.
 - 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (four inches) thick when approved by the COR for each job condition.
- E. Attachment to Steel Building Construction:
 - 1. Welded attachment: MSS SP-58, Type 22.
 - 2. Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 23mm (7/8-inch) outside diameter.
- G. Attachment to existing structure: Support from existing floor/roof frame.
- I. Hanger Rods: Hot-rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP-58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn-buckles shall provide 38 mm (1-1/2 inches) minimum of adjustment and incorporate locknuts. All-thread rods are acceptable.

J. Hangers Supporting Multiple Pipes (Trapeze Hangers): Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1-5/8 inches by 1-5/8 inches), 2.7 mm (No. 12 gage), designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.

1. Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2-inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.

K. Supports for Piping Systems:

1. Select hangers sized to encircle insulation on insulated piping. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION for insulation thickness. To protect insulation, provide Type 39 saddles for roller type supports or preinsulated calcium silicate shields. Provide Type 40 insulation shield or preinsulated calcium silicate shield at all other types of supports and hangers including those for preinsulated piping.
2. Piping Systems except High and Medium Pressure Steam (MSS SP-58):
 - a. Standard clevis hanger: Type 1; provide locknut.
 - b. Riser clamps: Type 8.
 - c. Wall brackets: Types 31, 32 or 33.
 - d. Roller supports: Type 41, 43, 44 and 46.
 - e. Saddle support: Type 36, 37 or 38.
 - f. Turnbuckle: Types 13 or 15. Preinsulate.
 - g. U-bolt clamp: Type 24.
 - h. Copper Tube:
 - 1) Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non-adhesive isolation tape to prevent electrolysis.
 - 2) For vertical runs use epoxy painted or plastic coated riser clamps.
 - 3) For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.

- 4) Insulated Lines: Provide pre-insulated calcium silicate shields sized for copper tube.
 - i. Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.
3. High and Medium Pressure Steam (MSS SP-58):
 - a. Provide eye rod or Type 17 eye nut near the upper attachment.
 - b. Piping 50 mm (2 inches) and larger: Type 43 roller hanger. For roller hangers requiring seismic bracing provide a Type 1 clevis hanger with Type 41 roller attached by flat side bars.
 - c. Piping with Vertical Expansion and Contraction:
 - 1) Movement up to 20 mm (3/4-inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - 2) Movement more than 20 mm (3/4-inch): Type 54 or 55 constant support unit with integral adjusting nut, turn buckle and travel position indicator.
4. Convertor and Expansion Tank Hangers: May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.
- L. Pre-insulated Calcium Silicate Shields:
 1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
 3. Shield thickness shall match the pipe insulation.
 4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.
 - a. Shields for supporting chilled or cold water shall have insulation that extends a minimum of 1 inch past the sheet metal. Provide for an adequate vapor barrier in chilled lines.
 - b. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.

5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.

M. Seismic Restraint of Piping and Ductwork: Comply with MSS SP-127.

2.12 PIPE PENETRATIONS

- A. Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
 - 1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
 - 2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
 - 3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of COR.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- E. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- F. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms, laundry work rooms, and animal rooms above basement. Except in mechanical rooms, connect sleeve with floor plate.
- G. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- H. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- I. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to

accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.

- J. Sealant and Adhesives: Shall be as specified in Section 07 92 00, JOINT SEALANTS.

2.13 DUCT PENETRATIONS

- A. Provide curbs for roof mounted piping, ductwork and equipment. Curbs shall be 18 inches high with continuously welded seams, built-in cant strip, interior baffle with acoustic insulation, curb bottom, hinged curb adapter.
- B. Provide firestopping for openings through fire and smoke barriers, maintaining minimum required rating of floor, ceiling or wall assembly. See section 07 84 00, FIRESTOPPING.

2.14 SPECIAL TOOLS AND LUBRICANTS

- A. Furnish, and turn over to the COR, tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Refrigerant Tools: Provide system charging/Evacuation equipment, gauges, fittings, and tools required for maintenance of furnished equipment.
- D. Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the COR.
- E. Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

2.15 WALL, FLOOR AND CEILING PLATES

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035-inch) for larger pipe.

- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

2.16 ASBESTOS

Materials containing asbestos are not permitted.

PART 3 - EXECUTION

3.1 ARRANGEMENT AND INSTALLATION OF EQUIPMENT AND PIPING

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Prepare equipment layout drawings to coordinate proper location and personnel access of all facilities. Submit the drawings for review as required by Part 1. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Operating Personnel Access and Observation Provisions: Select and arrange all equipment and systems to provide clear view and easy access, without use of portable ladders, for maintenance and operation of all devices including, but not limited to: all equipment items, valves, filters, strainers, transmitters, sensors, control devices. All gages and indicators shall be clearly visible by personnel standing on the floor or on permanent platforms. Do not reduce or change maintenance and operating space and access provisions that are shown on the drawings.
- C. Equipment and Piping Support: Coordinate structural systems necessary for pipe and equipment support with pipe and equipment locations to permit proper installation.
- D. Location of pipe sleeves, trenches and chases shall be accurately coordinated with equipment and piping locations.
- E. Cutting Holes:
1. Cut holes through concrete and masonry by rotary core drill. Pneumatic hammer, impact electric, and hand or manual hammer type drill will not be allowed, except as permitted by COR where working area space is limited.
 2. Locate holes to avoid interference with structural members such as beams or grade beams. Holes shall be laid out in advance and drilling done only after approval by COR. If the Contractor

- considers it necessary to drill through structural members, this matter shall be referred to COR for approval.
3. Do not penetrate membrane waterproofing.
- F. Interconnection of Instrumentation or Control Devices: Generally, electrical and pneumatic interconnections are not shown but must be provided.
- G. Minor Piping: Generally, small diameter pipe runs from drips and drains, water cooling, and other service are not shown but must be provided.
- I. Protection and Cleaning:
1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the COR. Damaged or defective items in the opinion of the COR, shall be replaced.
 2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- J. Concrete and Grout: Use concrete and shrink compensating grout 25 MPa (3000 psi) minimum. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- L. Install steam piping expansion joints as per manufacturer's recommendations.
- M. Work in Existing Building:
1. Perform as specified in Article, ALTERATIONS, and Article, RESTORATION of the Section 01 00 00, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).

2. As specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.
 3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the COR. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the COR for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After COR's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- O. Switchgear/Electrical Equipment Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints. Installation of piping, ductwork, leak protection apparatus or other installations foreign to the electrical installation shall be located in the space equal to the width and depth of the equipment and extending from to a height of 1.8 m (6 ft.) above the equipment of to ceiling structure, whichever is lower (NFPA 70).
- P. Inaccessible Equipment:
1. Where the Government determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Government.
 2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

3.2 TEMPORARY PIPING AND EQUIPMENT

- A. Continuity of operation of existing facilities will generally require temporary installation or relocation of equipment and piping.
- B. The Contractor shall provide all required facilities in accordance with the requirements of phased construction and maintenance of service. All piping and equipment shall be properly supported, sloped to drain,

operate without excessive stress, and shall be insulated where injury can occur to personnel by contact with operating facilities. The requirements of Paragraph 3.1 apply.

- C. Temporary facilities and piping shall be completely removed and any openings in structures sealed. Provide necessary blind flanges and caps to seal open piping remaining in service.

3.3 RIGGING

- A. Design is based on application of available equipment. Openings in building structures are planned to accommodate design scheme.
- B. Alternative methods of equipment delivery may be offered by Contractor and will be considered by Government under specified restrictions of phasing and maintenance of service as well as structural integrity of the building.
- C. Close all openings in the building when not required for rigging operations to maintain proper environment in the facility for Government operation and maintenance of service.
- D. Contractor shall provide all facilities required to deliver specified equipment and place on foundations. Attachments to structures for rigging purposes and support of equipment on structures shall be Contractor's full responsibility. Upon request, the Government will check structure adequacy and advise Contractor of recommended restrictions.
- E. Contractor shall check all clearances, weight limitations and shall offer a rigging plan designed by a Registered Professional Engineer. All modifications to structures, including reinforcement thereof, shall be at Contractor's cost, time and responsibility.
- F. Rigging plan and methods shall be referred to COR for evaluation prior to actual work.
- G. Restore building to original condition upon completion of rigging work.

3.4 PIPE AND EQUIPMENT SUPPORTS

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the COR.

- B. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean rusty products and paint with zinc primer.
- C. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work.
- D. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP-69. Provide additional supports at valves, strainers, in-line pumps and other heavy components. Provide a support within one foot of each elbow.
- E. HVAC Vertical Pipe Supports:
1. Up to 150 mm (6-inch pipe), 9 m (30 feet) long, bolt riser clamps to the pipe below couplings, or welded to the pipe and rests supports securely on the building structure.
 2. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- F. Overhead Supports:
1. The basic structural system of the building is designed to sustain the loads imposed by equipment and piping to be supported overhead.
 2. Provide steel structural members, in addition to those shown, of adequate capability to support the imposed loads, located in accordance with the final approved layout of equipment and piping.
 3. Tubing and capillary systems shall be supported in channel troughs.
- G. Floor Supports:
1. Provide concrete bases, concrete anchor blocks and pedestals, and structural steel systems for support of equipment and piping. Anchor and dowel concrete bases and structural systems to resist forces under operating and seismic conditions (if applicable) without excessive displacement or structural failure.
 2. Do not locate or install bases and supports until equipment mounted thereon has been approved. Size bases to match equipment mounted thereon plus 50 mm (2 inch) excess on all edges. Boiler foundations shall have horizontal dimensions that exceed boiler base frame dimensions by at least 150 mm (6 inches) on all sides. Refer to structural drawings. Bases shall be neatly finished and smoothed, shall have chamfered edges at the top, and shall be suitable for painting.

3. All equipment shall be shimmed, leveled, firmly anchored, and grouted with epoxy grout. Anchor bolts shall be placed in sleeves, anchored to the bases. Fill the annular space between sleeves and bolts with a granular material to permit alignment and realignment.
4. For seismic anchoring, refer to Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

3.5 MECHANICAL DEMOLITION

- A. Rigging access, other than indicated on the drawings, shall be provided by the Contractor after approval for structural integrity by the COR. Such access shall be provided without additional cost or time to the Government. Where work is in an operating plant, provide approved protection from dust and debris at all times for the safety of plant personnel and maintenance of plant operation and environment of the plant.
- B. In an operating facility, maintain the operation, cleanliness and safety. Government personnel will be carrying on their normal duties of operating, cleaning and maintaining equipment and plant operation. Confine the work to the immediate area concerned; maintain cleanliness and wet down demolished materials to eliminate dust. Do not permit debris to accumulate in the area to the detriment of plant operation. Perform all flame cutting to maintain the fire safety integrity of this plant. Adequate fire extinguishing facilities shall be available at all times. Perform all work in accordance with recognized fire protection standards. Inspection will be made by personnel of the VA Medical Center, and Contractor shall follow all directives of the RE or COTR with regard to rigging, safety, fire safety, and maintenance of operations.
- C. Completely remove all piping, wiring, conduit, and other devices associated with the equipment not to be re-used in the new work. This includes all pipe, valves, fittings, insulation, and all hangers including the top connection and any fastenings to building structural systems. Seal all openings, after removal of equipment, pipes, ducts, and other penetrations in roof, walls, floors, in an approved manner and in accordance with plans and specifications where specifically covered. Structural integrity of the building system shall be maintained. Reference shall also be made to the drawings and

specifications of the other disciplines in the project for additional facilities to be demolished or handled.

- D. All valves including gate, globe, ball, butterfly and check, all pressure gages and thermometers with wells shall remain Government property and shall be removed and delivered to COR and stored as directed. The Contractor shall remove all other material and equipment, devices and demolition debris under these plans and specifications. Such material shall be removed from Government property expeditiously and shall not be allowed to accumulate.

3.6 CLEANING AND PAINTING

- A. Prior to final inspection and acceptance of the plant and facilities for beneficial use by the Government, the plant facilities, equipment and systems shall be thoroughly cleaned and painted. Refer to Section 09 91 00, PAINTING.
- B. In addition, the following special conditions apply:
1. Cleaning shall be thorough. Use solvents, cleaning materials and methods recommended by the manufacturers for the specific tasks. Remove all rust prior to painting and from surfaces to remain unpainted. Repair scratches, scuffs, and abrasions prior to applying prime and finish coats.
 2. Material And Equipment Not To Be Painted Includes:
 - a. Motors, controllers, control switches, and safety switches.
 - b. Control and interlock devices.
 - c. Regulators.
 - d. Pressure reducing valves.
 - e. Control valves and thermostatic elements.
 - f. Lubrication devices and grease fittings.
 - g. Copper, brass, aluminum, stainless steel and bronze surfaces.
 - h. Valve stems and rotating shafts.
 - i. Pressure gauges and thermometers.
 - j. Glass.
 - k. Name plates.
 3. Control and instrument panels shall be cleaned, damaged surfaces repaired, and shall be touched-up with matching paint obtained from panel manufacturer.

4. Pumps, motors, steel and cast iron bases, and coupling guards shall be cleaned, and shall be touched-up with the same color as utilized by the pump manufacturer
5. Temporary Facilities: Apply paint to surfaces that do not have existing finish coats.
6. Paint shall withstand the following temperatures without peeling or discoloration:
 - a. Condensate and feedwater -- 38 degrees C (100 degrees F) on insulation jacket surface and 120 degrees C (250 degrees F) on metal pipe surface.
 - b. Steam -- 52 degrees C (125 degrees F) on insulation jacket surface and 190 degrees C (375 degrees F) on metal pipe surface.
7. Final result shall be smooth, even-colored, even-textured factory finish on all items. Completely repaint the entire piece of equipment if necessary to achieve this.

3.7 IDENTIFICATION SIGNS

- A. Provide laminated plastic signs, with engraved lettering not less than 5 mm (3/16-inch) high, designating functions, for all equipment, switches, motor controllers, relays, meters, control devices, including automatic control valves. Nomenclature and identification symbols shall correspond to that used in maintenance manual, and in diagrams specified elsewhere. Attach by chain, adhesive, or screws.
- B. Factory Built Equipment: Metal plate, securely attached, with name and address of manufacturer, serial number, model number, size, performance.
- C. Pipe Identification: Refer to Section 09 91 00, PAINTING.

3.8 MOTOR AND DRIVE ALIGNMENT

- A. Belt Drive: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.
- B. Direct-connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

3.9 LUBRICATION

- A. Lubricate all devices requiring lubrication prior to initial operation. Field-check all devices for proper lubrication.
- B. Equip all devices with required lubrication fittings or devices. Provide a minimum of one liter (one quart) of oil and 0.5 kg (one

pound) of grease of manufacturer's recommended grade and type for each different application; also provide 12 grease sticks for lubricated plug valves. Deliver all materials to COR in unopened containers that are properly identified as to application.

- C. Provide a separate grease gun with attachments for applicable fittings for each type of grease applied.
- D. All lubrication points shall be accessible without disassembling equipment, except to remove access plates.

3.11 STARTUP AND TEMPORARY OPERATION

Start up equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation. Temporary use of equipment is specified in Section 01 00 00, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

3.12 OPERATING AND PERFORMANCE TESTS

- A. Prior to the final inspection, perform required tests as specified in Section 01 00 00, GENERAL REQUIREMENTS and submit the test reports and records to the COR.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Government.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

- - - E N D - - -

**SECTION 26 05 11
REQUIREMENTS FOR ELECTRICAL INSTALLATIONS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section applies to all sections of Division 26.
- B. Reuse existing components in serviceable and good condition. Furnish and install replacement electrical systems, materials, equipment, and accessories in accordance with the drawings and as required by demolition and the course of the work. Capacities and ratings of motors, transformers, conductors and cable, switchboards, switchgear, panelboards, motor control centers, generators, automatic transfer switches, and other items and arrangements for the electrical items shall match existing, except as required by applicable codes.
- C. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.
- D. Conductor ampacities specified or shown on the drawings are based on copper conductors, with the conduit and raceways sized per NEC. Aluminum conductors are prohibited.

1.2 MINIMUM REQUIREMENTS

- A. The International Building Code (IBC), National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), and National Fire Protection Association (NFPA) codes and standards are the minimum requirements for materials and installation.
- B. The drawings and specifications shall govern in those instances where requirements are greater than those stated in the above codes and standards.

1.3 TEST STANDARDS

- A. All materials and equipment shall be listed, labeled, or certified by a Nationally Recognized Testing Laboratory (NRTL) to meet Underwriters Laboratories, Inc. (UL), standards where test standards have been established. Materials and equipment which are not covered by UL standards will be accepted, providing that materials and equipment are listed, labeled, certified or otherwise determined to meet the safety

requirements of a NRTL. Materials and equipment which no NRTL accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as ANSI, NEMA, and NETA. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Materials and equipment included in a list published by an organization that is acceptable to the Authority Having Jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production or listed materials and equipment or periodic evaluation of services, and whose listing states that the materials and equipment either meets appropriate designated standards or has been tested and found suitable for a specified purpose.
2. Labeled: Materials and equipment to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the Authority Having Jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled materials and equipment, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.
3. Certified: Materials and equipment which:
 - a. Have been tested and found by a NRTL to meet nationally recognized standards or to be safe for use in a specified manner.
 - b. Are periodically inspected by a NRTL.
 - c. Bear a label, tag, or other record of certification.
4. Nationally Recognized Testing Laboratory: Testing laboratory which is recognized and approved by the Secretary of Labor in accordance with OSHA regulations.

1.4 QUALIFICATIONS (PRODUCTS AND SERVICES)

- A. Manufacturer's Qualifications: The manufacturer shall regularly and currently produce, as one of the manufacturer's principal products, the materials and equipment specified for this project, and shall have manufactured the materials and equipment for at least three years.
- B. Product Qualification:

1. Manufacturer's materials and equipment shall have been in satisfactory operation, on three installations of similar size and type as this project, for at least three years.
2. The Government reserves the right to require the Contractor to submit a list of installations where the materials and equipment have been in operation before approval.

C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within eight hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.5 APPLICABLE PUBLICATIONS

- A. Applicable publications listed in all Sections of Division 26 are the latest issue, unless otherwise noted.
- B. Products specified in all sections of Division 26 shall comply with the applicable publications listed in each section.

1.6 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, and for which replacement parts shall be available. Materials and equipment furnished shall be new, and shall have superior quality and freshness.
- B. When more than one unit of the same class or type of materials and equipment is required, such units shall be the product of a single manufacturer.
- C. Equipment Assemblies and Components:
 1. Components of an assembled unit need not be products of the same manufacturer.
 2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 3. Components shall be compatible with each other and with the total assembly for the intended service.
 4. Constituent parts which are similar shall be the product of a single manufacturer.

- D. Factory wiring and terminals shall be identified on the equipment being furnished and on all wiring diagrams.
- E. When Factory Tests are specified, Factory Tests shall be performed in the factory by the equipment manufacturer, and witnessed by the contractor. In addition, the following requirements shall be complied with:
 - 1. The Government shall have the option of witnessing factory tests. The Contractor shall notify the Government through the COR a minimum of thirty (30) days prior to the manufacturer's performing of the factory tests.
 - 2. When factory tests are successful, contractor shall furnish four (4) copies of the equipment manufacturer's certified test reports to the COR fourteen (14) days prior to shipment of the equipment, and not more than ninety (90) days after completion of the factory tests.
 - 3. When factory tests are not successful, factory tests shall be repeated in the factory by the equipment manufacturer, and witnessed by the Contractor. The Contractor shall be liable for all additional expenses for the Government to witness factory re-testing.

1.7 VARIATIONS FROM CONTRACT REQUIREMENTS

- A. Where the Government or the Contractor requests variations from the contract requirements, the connecting work and related components shall include, but not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and installation methods.

1.8 MATERIALS AND EQUIPMENT PROTECTION

- A. Materials and equipment shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.
 - 1. Store materials and equipment indoors in clean dry space with uniform temperature to prevent condensation.
 - 2. During installation, equipment shall be protected against entry of foreign matter, and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

3. Damaged equipment shall be repaired or replaced, as determined by the COR.
4. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
5. Damaged paint on equipment shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

- A. All electrical work shall comply with the requirements of NFPA 70 (NEC), NFPA 70B, NFPA 70E, OSHA Part 1910 subpart J - General Environmental Controls, OSHA Part 1910 subpart K - Medical and First Aid, and OSHA Part 1910 subpart S - Electrical, in addition to other references required by contract.
- B. Job site safety and worker safety is the responsibility of the Contractor.
- C. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:
 1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.
 2. Before initiating any work, a job specific work plan must be developed by the Contractor with a peer review conducted and documented by the COR and Medical Center staff. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used, and exit pathways.
 3. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the COR.
- D. For work that affects existing electrical systems, arrange, phase and perform work to assure minimal interference with normal functioning of the facility. Refer to Article OPERATIONS AND STORAGE AREAS under Section 01 00 00, GENERAL REQUIREMENTS.
- E. New work shall be installed and connected to existing work neatly, safely and professionally. Disturbed or damaged work shall be replaced

or repaired to its prior conditions, as required by Section 01 00 00,
GENERAL REQUIREMENTS.

- F. Coordinate location of equipment and conduit with other trades to minimize interference.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. Equipment location shall be as close as practical to locations shown on the drawings.
- B. Working clearances shall not be less than specified in the NEC.
- C. Inaccessible Equipment:
 - 1. Where the Government determines that the Contractor has installed equipment not readily accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the Government.
 - 2. "Readily accessible" is defined as being capable of being reached quickly for operation, maintenance, or inspections without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit and raceways.
- D. Electrical service entrance equipment and arrangements for temporary and permanent connections to the electric utility company's system shall conform to the electric utility company's requirements. Coordinate fuses, circuit breakers and relays with the electric utility company's system, and obtain electric utility company approval for sizes and settings of these devices.

1.11 EQUIPMENT IDENTIFICATION

- A. In addition to the requirements of the NEC, install an identification sign which clearly indicates information required for use and maintenance of items such as switchboards and switchgear, panelboards, cabinets, motor controllers, fused and non-fused safety switches, generators, automatic transfer switches, separately enclosed circuit breakers, individual breakers and controllers in switchboards, switchgear and motor control assemblies, control devices and other significant equipment.
- B. Identification signs for Normal Power System equipment shall be laminated black phenolic resin with a white core with engraved lettering. Identification signs for Essential Electrical System (EES) equipment, as defined in the NEC, shall be laminated red phenolic resin

with a white core with engraved lettering. Lettering shall be a minimum of 12 mm (1/2 inch) high. Identification signs shall indicate equipment designation, rated bus amperage, voltage, number of phases, number of wires, and type of EES power branch as applicable. Secure nameplates with screws.

- C. Install adhesive arc flash warning labels on all equipment as required by NFPA 70E. Label shall show specific and correct information for specific equipment based on its arc flash calculations. Label shall show the followings:
1. Nominal system voltage.
 2. Arc flash boundary (inches).
 3. Available arc flash incident energy at the corresponding working distance (calories/cm²).
 4. Required PPE category and description.
 5. limited approach distance (inches), restricted approach distance (inches).
 6. Equipment/bus name, date prepared, and manufacturer name and address.

1.12 SUBMITTALS

- A. Submit to the COR in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. The Government's approval shall be obtained for all materials and equipment before delivery to the job site. Delivery, storage or installation of materials and equipment which has not had prior approval will not be permitted.
- C. All submittals shall include six copies of adequate descriptive literature, catalog cuts, shop drawings, test reports, certifications, samples, and other data necessary for the Government to ascertain that the proposed materials and equipment comply with drawing and specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify specific materials and equipment being submitted.
- D. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval.

1. Mark the submittals, "SUBMITTED UNDER SECTION ELECTRICAL REPAIRS/REPLACEMENTS".

E. The submittals shall include the following:

1. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, manuals, pictures, nameplate data, and test reports as required.
2. Submittals are required for all equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion, etc.) associated with equipment or piping so that the proposed installation can be properly reviewed. Include sufficient fabrication information so that appropriate mounting and securing provisions may be designed and attached to the equipment.
3. Elementary and interconnection wiring diagrams for communication and signal systems, control systems, and equipment assemblies. All terminal points and wiring shall be identified on wiring diagrams.
4. Parts list which shall include information for replacement parts and ordering instructions, as recommended by the equipment manufacturer.

F. Maintenance and Operation Manuals:

1. Submit as required for systems and equipment specified in the technical sections. Furnish in hardcover binders or an approved equivalent.
2. Inscribe the following identification on the cover: the words "MAINTENANCE AND OPERATION MANUAL," the name and location of the system, material, equipment, building, name of Contractor, and contract name and number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the material or equipment.
3. Provide a table of contents and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
4. The manuals shall include:

- a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.
 - c. Description of the function of each principal item of equipment.
 - d. Installation instructions.
 - e. Safety precautions for operation and maintenance.
 - f. Diagrams and illustrations.
 - g. Periodic maintenance and testing procedures and frequencies, including replacement parts numbers.
 - h. Performance data.
 - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare and replacement parts, and name of servicing organization.
 - j. List of factory approved or qualified permanent servicing organizations for equipment repair and periodic testing and maintenance, including addresses and factory certification qualifications.
- G. Approvals will be based on complete submission of shop drawings, manuals, test reports, certifications, and samples as applicable.
- H. After approval and prior to installation, furnish the COR with one sample of each of the following:
1. A minimum 300 mm (12 inches) length of each type and size of wire and cable along with the tag from the coils or reels from which the sample was taken. The length of the sample shall be sufficient to show all markings provided by the manufacturer.
 2. Each type of conduit coupling, bushing, and termination fitting.
 3. Conduit hangers, clamps, and supports.
 4. Duct sealing compound.
 5. Each type of receptacle, toggle switch, lighting control sensor, outlet box, manual motor starter, device wall plate, engraved nameplate, wire and cable splicing and terminating material, and branch circuit single pole molded case circuit breaker.

1.13 SINGULAR NUMBER

- A. Where any device or part of equipment is referred to in these specifications in the singular number (e.g., "the switch"), this

reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.15 ACCEPTANCE CHECKS AND TESTS

- A. The Contractor shall furnish the instruments, materials, and labor for tests.
- B. Where systems are comprised of components specified in more than one section of Division 26, the Contractor shall coordinate the installation, testing, and adjustment of all components between various manufacturer's representatives and technicians so that a complete, functional, and operational system is delivered to the Government.
- C. When test results indicate any defects, the Contractor shall repair or replace the defective materials or equipment, and repeat the tests. Repair, replacement, and retesting shall be accomplished at no additional cost to the Government.

1.16 WARRANTY

- A. All work performed and all equipment and material furnished under this Division shall be free from defects and shall remain so for a period of one year from the date of acceptance of the entire installation by the Contracting Officer for the Government.

1.17 INSTRUCTION

- A. Instruction to designated Government personnel shall be provided for the particular equipment or system as required in each associated technical specification section.
- B. Furnish the services of competent and factory-trained instructors to give full instruction in the adjustment, operation, and maintenance of the specified equipment and system, including pertinent safety requirements. Instructors shall be thoroughly familiar with all aspects of the installation, and shall be factory-trained in operating theory as well as practical operation and maintenance procedures.
- C. A training schedule shall be developed and submitted by the Contractor and approved by the COR at least 30 days prior to the planned training.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

---END---

**SECTION 26 41 00
FACILITY LIGHTNING PROTECTION**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the removal and re-installation of a complete UL master labeled lightning protection system.

1.2 RELATED WORK

- A. Section 07 60 00, FLASHING AND SHEET METAL: Penetrations through the roof.
- B. Section 01 00 00, GENERAL REQUIREMENTS: Removal, Storage, and handling of material salvaged for reuse and reinstallation.

1.3 QUALITY ASSURANCE

- A. Refer to Paragraph, QUALIFICATIONS, (PRODUCTS AND SERVICES), in Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.

1.4 SUBMITTALS

- A. Submit the following in accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS.
1. Shop Drawings:
 - a. Submit sufficient information to demonstrate compliance with drawings and specifications.
 - b. Show locations of air terminals, connections to required metal surfaces, down conductors, and grounding means.
 - c. Show the mounting hardware and materials used to attach air terminals and conductors to the structure.
 2. Certifications: Two weeks prior to final inspection, submit the following.
 - a. Certification by the manufacturer that the lightning protection system conforms to the requirements of the drawings and specifications.
 - b. Certification by the Contractor that the lightning protection system has been properly installed and inspected.
 - c. Certification that the lightning protection system has been inspected by a UL representative and has been approved by UL without variation.

1.5 APPLICABLE PUBLICATIONS

- A. Publications listed below (including amendments, addenda, revisions, supplements, and errata) form a part of this specification to the extent referenced. Publications are referenced in the text by designation only.
- B. National Fire Protection Association (NFPA):
 - 70-11.....National Electrical Code (NEC)
 - 780-11.....Standard for the Installation of Lightning Protection Systems
- C. Underwriters Laboratories, Inc. (UL):
 - 96-05.....Lightning Protection Components
 - 96A-07.....Installation Requirements for Lightning Protection Systems
 - 467-07.....Standard for Grounding and Bonding Equipment

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. Lightning protection components shall conform to NFPA 780 and UL 96, for use on Class I structures. Aluminum materials are not allowed.
 - 1. Class I conductors: Copper.
 - 2. Class I air terminals: Solid copper, long, not less than 9.5 mm (3/8 inch) diameter, with sharp bare copper points.
 - 3. Ground rods: existing to remain.
 - 4. Ground plates: existing to remain.
 - 5. Bonding plates: existing to remain.
 - 6. Through roof connectors: Solid copper riser bar, length and type as required to accommodate roof structure and flashing requirements.
 - 7. Down conductor guards: existing to remain.
 - 8. Anchors and fasteners: Bronze bolt and clamp type shall be used for all applications except for membrane roof. Adhesive type are allowed only for attachment to membrane roof materials, using adhesive that is compatible with the membrane material.
 - 9. Connectors: Bronze clamp-type connectors shall be used for roof conductor splices, and the connection of the roof conductor to air terminals and bonding plates. Crimp-type connectors are not allowed.

10. Exothermic welds: Exothermic welds shall be used for splicing the roof conductor to the down conductors, splices of the down conductors, and for connection of the down conductors to ground rods, ground plates, and the ground ring.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Installation shall be coordinated with the roofing manufacturer and installer.
- B. Install the conductors as inconspicuously as practical.
- C. Install the down conductors within the concealed cavity of exterior walls where practical. Run the down conductors to the exterior at elevations below the finished grade.
- D. Where down conductors are subject to damage or are accessible near grade, protect with down conductor guards to 2.4 m (8 feet) above grade. Bond down conductor guards to down conductor at both ends.
- E. Make connections of dissimilar metal with bimetallic type fittings to prevent electrolytic action.
- F. Use existing ground rods and ground plates.
- G. Bond down conductors to metal main water piping where applicable.
- H. Bond down conductors to building structural steel.
- I. Connect roof conductors to all metallic projections and equipment above the roof as indicated on the drawings.
- J. Connect exterior metal surfaces, located within 900 mm (3 feet) of the conductors, to the conductors to prevent flashovers.
- K. Maintain horizontal or downward coursing of main conductor and insure that all bends have at least an 200 mm (8 inches) radius and do not exceed 90 degrees.
- L. Conductors shall be rigidly fastened every 900 mm (3 feet) along the roof and down to the building to ground.
- M. Air terminals shall be secured against overturning either by attachment to the object to be protected or by means of a substantial tripod or other braces permanently and rigidly attached to the building or structure.
- N. Install air terminal bases, cable holders and other roof-system supporting means without piercing membrane or metal roofs.
- O. Use through-roof connectors for penetration of the roof system. Flashing

shall be provided by roofing contractor in accordance with Section 07 60 00, FLASHING AND SHEET METAL.

- P. Down conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel or the structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 30 M (100 feet).
- Q. A counterpoise or ground ring, where shown, shall be of No. 1/0 copper cable having suitable resistance to corrosion and shall be laid around the perimeter of the structure in a trench not less than 600 mm (2 feet) deep at a distance not less than 900 mm (3 feet) nor more than 2.5 M (8 feet) from the nearest point of the structure.
- R. On construction utilizing post tensioning systems to secure precast concrete sections, the post tension rods shall not be used as a path for lightning to ground.
1. Weld or bond the non-electrically-continuous sections together and make them electrically continuous.
 2. Verify the electrical continuity by measuring the ground resistances to earth at the ground level, at the top of the building or stack, and at intermediate points with a sensitive ohmmeter. Compare the resistance readings.
 3. Connect the air terminals together with an exterior conductor connected to the structural steel framework at not more than 18 m (60 foot) intervals.
 4. Install ground connections to earth at not more than 18 m (60 foot) intervals around the perimeter of the building.
 5. Weld or braze bonding plates to cleaned sections of the steel and connect the conductors to the plates.
 6. Do not pierce the structural steel in any manner. Connections to the structural steel shall conform to UL 96A.
- U. Where the drawings show the existing lightning protection system reconnected with or without a UL master label, the reinstalled portion of the lightning protection system requires UL inspection and a Letter of Findings.

3.2 ACCEPTANCE CHECKS AND TESTS

- A. Test the ground resistance to earth by standard methods, and conform to the ground resistance requirements specified in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- B. A UL representative shall inspect the lightning protection system. Obtain and install a UL numbered master label for each of the lightning protection systems at the location directed by the UL representative and the COR.

---END---

Louis A. Johnson VAMC
Replace Roof Main Building & Clinical Addition
Clarksburg, WV 26301

April 7, 2016
100% Bid Documents
Project No. 540-13-308

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