VA | U.S. Department of Veterans Affairs

Specifications

Birmingham Veterans Affairs Medical Center

700 South 19th Street

Birmingham, AL 35233

Renovate Wards 2k/2b For Optometry/Ophthalmology Building #1

VA Contract No. 36C24724C0036
Station Project No. 521-24-102
Bancroft-AE Project No. 23-135

IFB Construction Documents Submittal
Vol 1 - Divisions 00-14
Vol 2 - Divisions 21-48

05/15/2026

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Mount Prospect, IL 60056
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BANCROFT ARCHITECTS + ENGINEERS
VA CONTRACT NO.36C24724C0036
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DIVISION 00
SPECIAL SECTIONS

DEPARTMENT OF VETERANS AFFAIRS
VHA MASTER SPECIFICATIONS

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DIVISION 01

GENERAL REQUIREMENTS

SECTION 01 00 00
GENERAL REQUIREMENTS

GENERAL

1.1 SAFETY REQUIREMENTS

A. Refer to section 01 35 26, SAFETY REQUIREMENTS for safety and infection control requirements.

1.2 GENERAL INTENTION

A. Contractor shall completely prepare site for building operations, including demolition and removal of existing structures, and furnish labor and materials and perform work for as required by drawings and specifications.

B. Visits to the site by Bidders may be made only by appointment with the Medical Center COR.

C. Offices of Bancroft Architects and Engineers, as Architect-Engineers, will render certain technical services during construction. Such services shall be considered as advisory to the Government and shall not be construed as expressing or implying a contractual act of the Government without affirmations by Contracting Officer or his duly authorized representative.

1.3 STATEMENT OF BID ITEM(S)

A. ITEM I, GENERAL CONSTRUCTION: BASE BID : Work includes general construction, alterations, necessary removal of existing structures and construction and certain other items.

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 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. Patients and staff are not to be photographed at any time.
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. See Section 08 71 00, DOOR HARDWARE and coordinate.

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 permits shall be issued for General Contractor and its employees for parking in designated areas only. Contractor to coordinate with VA Medical Center Facility Manager.Remote parking off site would be available, second floor would be available for contractor to utilize during construction. Contractor to coordinate parking accommodation with the VA.

1.6 OPERATIONS AND STORAGE AREAS (FAR 52.236-10)

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.

D. Working space and space available for storing materials shall be as determined by the COR .

E. Workers are subject to rules of Medical Center applicable to their conduct.

F. Execute work in such a manner as to interfere as little as possible with work being done by others. Keep roads clear of construction materials, debris, standing construction equipment and vehicles at all times.

G. 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.

H. 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 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.

I. Phasing:

1. 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:
2. To ensure such executions, Contractor shall furnish the COR with a schedule of approximate 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 dates to ensure accomplishment of this work in successive phases mutually agreeable to Medical Center Director, COR and Contractor, as follows:

Phase I: 2K WING, PARTIAL 2B WIND, SEE DRAWINGS
Phase II: 2B WING, SEE DRAWINGS

J. Part of Bldg. __1, 2K WING,___will be vacated by Government in accordance with above phasing beginning immediately after date of receipt of Notice to Proceed and turned over to Contractor.

1. Contractor shall take all measures and provide all material necessary for protecting existing equipment and property in affected areas of construction against dust and debris, so that equipment and affected areas to be used in the Medical Centers operations will not be hindered. Contractor shall permit access to Department of Veterans Affairs personnel and patients through other construction areas which serve as routes of access to such affected areas and equipment. These routes whether access or egress shall be isolated from the construction area by temporary partitions and have walking surfaces, lighting etc. to facilitate patient and staff access.

Coordinate alteration work in areas occupied by Department of Veterans Affairs so that Medical Center operations will continue during the construction period.

2. Immediate areas of alterations not mentioned in preceding Subparagraph 1 will be temporarily vacated while alterations are performed.

K. When a building and/or construction site is turned over to Contractor, Contractor shall accept entire responsibility including upkeep and maintenance therefore:

1. Contractor shall maintain a minimum temperature of 4 degrees C (40 degrees F) at all times, except as otherwise specified.
2. Contractor shall maintain in operating condition existing fire protection and alarm equipment. In connection with fire alarm equipment, Contractor shall make arrangements for pre-inspection of site with Fire Department or Company (Department of Veterans Affairs or municipal) whichever will be required to respond to an alarm from Contractor's employee or watchman.

L. 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. 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 00, COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY 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.

M. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, shall be removed back to their source. Those which are indicated 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.

N. 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.
2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the COR.

O. 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.

1.7 ALTERATIONS

A. Survey: Before any work is started, the Contractor shall make a thorough survey with the COR and a representative of VA Supply Service, of areas of buildings in which alterations occur and areas which are anticipated routes of access, and furnish a report, signed by both to the Contracting Officer. This report shall list by rooms and spaces:
   1. Existing condition and types of resilient flooring, doors, windows, walls and other surfaces not required to be altered throughout affected areas of buildings.
   2. Existence and conditions of items such as plumbing fixtures and accessories, electrical fixtures, equipment, venetian blinds, shades, etc., required by drawings to be either reused or relocated, or both.
   3. Shall note any discrepancies between drawings and existing conditions at site.
   4. Shall designate areas for working space, materials storage and routes of access to areas within buildings where alterations occur and which have been agreed upon by Contractor and COR.

B. Any items required by drawings to be either reused or relocated or both, found during this survey to be nonexistent, or in opinion of COR, to be in such condition that their use is impossible or impractical, shall be furnished and/or replaced by Contractor with new items in accordance with specifications which will be furnished by Government. Provided the contract work is changed by reason of this subparagraph B, the contract will be modified accordingly, under

provisions of clause entitled "DIFFERING SITE CONDITIONS" (FAR 52.236-2) and "CHANGES" (FAR 52.243-4).

C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and COR together shall make a thorough re-survey of the areas of buildings involved. They shall furnish a report on conditions then existing, of resilient flooring, doors, windows, walls and other surfaces as compared with conditions of same as noted in first condition survey report:
   1. Re-survey report shall also list any damage caused by Contractor to such flooring and other surfaces, despite protection measures; and, will form basis for determining extent of repair work required of Contractor to restore damage caused by Contractor's workers in executing work of this contract.

D. Protection: Provide the following protective measures:
   1. Wherever existing roof surfaces are disturbed they shall be protected against water infiltration. In case of leaks, they shall be repaired immediately upon discovery.
   2. Temporary protection against damage for portions of existing structures and grounds where work is to be done, materials handled and equipment moved and/or relocated.
   3. Protection of interior of existing structures at all times, from damage, dust and weather inclemency. Wherever work is performed, floor surfaces that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 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 noted on drawings or in specifications 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.

1.9 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS (FAR 52.236-9)

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 workers, 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.

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.

1.10 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 workers 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 "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.11 PHYSICAL DATA – SOIL CONDITIONS

1.12 PROFESSIONAL SURVEYING SERVICES

1.13 LAYOUT OF WORK

1.14 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 ensure 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 within 15 calendar days after each completed phase and after the acceptance of the project by the COR.

D. Paragraphs A, B, & C shall also apply to all shop drawings.

1.15 WARRANTY MANAGEMENT

A. Warranty Management Plan: Develop a warranty management plan which contains information relevant to FAR 52.246-21 Warranty of Construction in at least 30 days before the planned pre-warranty conference, submit one set of the warranty management plan. Include within the warranty management plan all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan must be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesman, or of engineering background, not necessarily familiar with this contract. The term “status” as indicated below must include due date and whether item has been submitted or was approved. Warranty information made available during the construction phase must be submitted to the Contracting Officer for approval prior to each monthly invoice for payment. Assemble approved information in a binder and turn over to the Government upon acceptance of the work. The construction warranty period will begin on the date of the project acceptance and continue for the product warranty period. A joint 4 month and 9 month warranty inspection will be conducted, measured from time of acceptance, by the Contactor and the Contracting Officer. Include in the warranty management plan, but not limited to, the following:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the company of the Contractor, subcontractors, manufacturers or suppliers involved.
2. Furnish with each warranty the name, address and telephone number of each of the guarantor's representatives nearest project location.
3. Listing and status of delivery of all Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers and for all commissioned systems such as fire protection and alarm systems, sprinkler systems and lightning protection systems, etc.
4. A list for each warranted equipment item, feature of construction or system indicating:
   a. Name of item.
   b. Model and serial numbers.
   c. Location where installed.
   d. Name and phone numbers of manufacturers and suppliers.
   e. Name and phone numbers of manufacturers or suppliers.
   f. Names, addresses and phone numbers of sources of spare parts.
   g. Warranties and terms of warranty. Include one-year overall warranty of construction, including the starting date of warranty of construction. Items which have extended warranties must be indicated with separate warranty expiration dates.
   h. Starting point and duration of warranty period.
   i. Summary of maintenance procedures required to continue the warranty in force.
   j. Cross-reference to specific pertinent Operation and Maintenance manuals.
   k. Organizations, names and phone numbers of persons to call for warranty service.
   l. Typical response time and repair time expected for various warranted equipment.
5. The plans for attendance at the 4 and 9-month post construction warranty inspections conducted by the government.

6. Procedure and status of tagging of all equipment covered by extended warranties.
7. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

B. Performance & Payment Bonds: The Performance & Payment Bonds must remain effective throughout the construction period
   1. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Contracting Officer will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
   2. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the contractor’s expenses, the Contracting Officer will have the right to recoup expenses from the bonding company.
   3. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure to respond will be cause for the Contracting Officer to proceed against the Contractor.

C. Pre-Warranty Conference: Prior to contract completion, and at a time designated by the Contracting Officer, the Contractor shall meet with the Contracting Officer to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Contracting Officer for the execution of the construction warranty will be established/ reviewed at this meeting. In connection with these requirements and at the time of the Contractor’s quality control completion inspection, furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor.

This point of contract will be located within the local service area of the warranted construction, be continuously available and be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in conjunction with other portions of this provision.

D. Contractor's Response to Construction Warranty Service Requirements:

E. Following oral or written notification by the Contracting Officer, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. Submit a report on any warranty item that has been repaired during the warranty period. Include within the report the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframe specified, the Government will perform the work and back charge the construction warranty payment item established.

1. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
2. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
3. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.
4. The "Construction Warranty Service Priority List" is as follows:

a) Code 1-Life Safety Systems
   1) Fire suppression systems.
   2) Fire alarm system(s).

b) Code 1-Air Conditioning Systems
   1) Air conditioning leak in part of the building, if causing damage.
   2) Air conditioning system not cooling properly.

c) Code 1 Doors

1) Interior, exterior personnel doors or hardware, not functioning properly, causing security, fire or safety problem.

d) Code 3-Doors
   1) Overhead doors not operational.
   2) Interior/exterior personnel doors or hardware not functioning properly.

e) Code 1-Electrical
   1) Power failure (entire area or any building operational after 1600 hours).
   2) Security lights.
   3) Smoke detectors.

f) Code 2-Electrical
   1) Power failure (no power to a room or part of building). Receptacle and lights not operational (in a room or part of building).

g) Code 3-Electrical
   1) Exterior lights not operational.

h) Code 1-Gas
   1) Leaks and pipeline breaks.

i) Code 1-Heat
   1) Power failure affecting heat.

j) Code 1-Plumbing
   1) Hot water heater failure.
   2) Leaking water supply pipes

k) Code 2-Plumbing
   1) Flush valves not operating properly
   2) Fixture drain, supply line or any water pipe leaking.
   3) Toilet leaking at base.

l) Code 3- Plumbing
   1) Leaky faucets.

m) Code 3-Interior
   1) Floors damaged.
   2) Paint chipping or peeling.
   3) Casework damaged.

n) Code 1-Roof Leaks

1) Damage to property is occurring.

o) Code 2-Water (Exterior)

1) No water to facility.

p) Code 2-Water (Hot)

1) No hot water in portion of building listed.

q) Code 3

1) All work not listed above.

F. Warranty Tags: At the time of installation, tag each warranted item with a durable, oil and water-resistant tag approved by the Contracting Officer. Attach each tag with a copper wire and spray with a silicone waterproof coating. Also submit two record copies of the warranty tags showing the layout and design. The date of acceptance and the QC signature must remain blank until the project is accepted for beneficial occupancy. Show the following information on the tag.

Warranty Tags
Type of product/material
Model number
Serial number
Contract number
Warranty period from/to
Inspector’s signature
Construction Contractor
Address
Telephone number
Warranty Contact
Address
Telephone number
Warranty response time priority code

1.16 USE OF ROADWAYS

1.17 RESIDENT ENGINEER'S FIELD OFFICE

1.18 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. Boilers, pumps, feedwater heaters and auxiliary equipment must be operated as a complete system and be fully maintained by operating personnel. Boiler water must be given complete and continuous chemical treatment.

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.

1.19 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.

B. Use of existing elevator 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 Nos. 5 in Building No. 1 for daily use between the hours of _____. 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.

1.20 TEMPORARY USE OF NEW ELEVATORS

1.

1.21 TEMPORARY TOILETS

1.22 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.

a) Steam is available at no cost to Contractor.

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.

G. Fuel: Natural and LP gas and burner fuel oil required for boiler cleaning, normal initial boiler-burner setup and adjusting, and for performing the specified boiler tests will be furnished by the Government. Fuel required for prolonged boiler-burner setup, adjustments, or modifications due to improper design or operation of boiler, burner, or control devices shall be furnished and paid by the Contractor at Contractor's expense.

1.23 NEW TELEPHONE EQUIPMENT

A. The contractor shall coordinate with the work of installation of telephone equipment by others. This work shall be completed before the building is turned over to VA.

1.24 TESTS

A. As per specification section 23 05 93 the contractor shall provide a written testing plan complete with component level, equipment level,

sub-system level and system level breakdowns. 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 an authorized representative 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 reasonably 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.

1.25 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 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. 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 GOVERNMENT-FURNISHED PROPERTY

A. The Government shall deliver to the Contractor, the Government-furnished property shown on the drawings.

B. Equipment furnished by Government to be installed by Contractor will be furnished to Contractor at the Medical Center.

C. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive equipment furnished by Government. Arrangements will then be made by the Government for delivery of equipment.

1. Immediately upon delivery of equipment, Contractor shall arrange for a joint inspection thereof with a representative of the Government. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Government.

D. Equipment furnished by the Government will be delivered in a partially assembled (knock down) condition in accordance with existing standard commercial practices, complete with all fittings, fastenings, and appliances necessary for connections to respective services installed under contract. All fittings and appliances (i.e., couplings, ells, tees, nipples, piping, conduits, cables, and the like) necessary to make the connection between the Government furnished equipment item and

the utility stub-up shall be furnished and installed by the contractor at no additional cost to the Government.

E. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.

F. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.27 RELOCATED EQUIPMENT

A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment 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. 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.

1.28 STORAGE SPACE FOR DEPARTMENT OF VETERANS AFFAIRS EQUIPMENT

1.29 CONSTRUCTION SIGN

1.30 SAFETY SIGN

A. Provide a Safety Sign where directed by COR. Face of sign shall be 19 mm (3/4 inch) thick exterior grade plywood. Provide two 100 mm by 100 mm (four by four inch) posts extending full height of sign and 900 mm (three feet) into ground. Set bottom of sign level at 1200 mm (four feet) above ground.

B. Paint all surfaces of Safety Sign and posts with one prime coat and two coats of white gloss paint. Letters and design shall be painted with gloss paint of colors noted.

C. Maintain sign and remove it when directed by COR.

D. Drawing details in VA Signage Design Manual, Section 11 Specialty Signs (found on VA TIL) show required legend and other characteristics of sign and are shown on the drawings.

E. Post the number of accident free days on a daily basis.

1.31 PHOTOGRAPHIC DOCUMENTATION

A. During the construction period through completion, provide photographic documentation of construction progress and at selected milestones including electronic indexing, navigation, storage and remote access to the documentation, as per these specifications. The commercial photographer or the subcontractor used for this work shall meet the following qualifications:

1. Demonstrable minimum experience of three (3) years in operation providing documentation and advanced indexing/navigation systems including a representative portfolio of construction projects of similar type, size, duration and complexity as the Project.
2. Demonstrable ability to service projects throughout North America, which shall be demonstrated by a representative portfolio of active projects of similar type, size, duration and complexity as the Project.

B. Photographic documentation elements:

1. Each digital image shall be taken with a professional grade camera with minimum size of 6 megapixels (MP) capable of producing 200x250mm (8 x 10 inch) prints with a minimum of 2272 x 1704 pixels

and 400x500mm (16 x 20 inch) prints with a minimum 2592 x 1944 pixels.

2. Indexing and navigation system shall utilize actual AUTOCAD construction drawings, making such drawings interactive on an on-line interface. For all documentation referenced herein, indexing and navigation must be organized by both time (date-stamped) and location throughout the project.
3. Documentation shall combine indexing and navigation system with inspection-grade digital photography designed to capture actual conditions throughout construction and at critical milestones. Documentation shall be accessible on-line through use of an internet connection. Documentation shall allow for secure multiple-user access, simultaneously, on-line.
4. Before construction, the building pad, adjacent streets, roadways, parkways, driveways, curbs, sidewalks, landscaping, adjacent utilities and adjacent structures surrounding the building pad and site shall be documented. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings. If site work or pad preparation is extensive, this documentation may be required immediately before construction and at several pre-determined intervals before building work commences.
5. Construction progress for all trades shall be tracked at pre-determined intervals, but not less than once every thirty (30) calendar days (“Progressions”). Progression documentation shall track both the exterior and interior construction of the building. Exterior Progressions shall track 360 degrees around the site and each building. Interior Progressions shall track interior improvements beginning when stud work commences and continuing until Project completion.
6. As-built condition of pre-foundation utilities and site utilities shall be documented prior to pouring footers, placing concrete and/or backfilling. This process shall include all underground and in-slab utilities within the building(s) envelope(s) and utility runs in the immediate vicinity of the building(s) envelope(s). This

may also include utilities enclosed in slab-on-deck in multi-story buildings. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive site utility plans.

7. As-built conditions of mechanical, electrical, plumbing and all other systems shall be documented post-inspection and pre-insulation, sheet rock or dry wall installation. This process shall include all finished systems located in the walls and ceilings of all buildings at the Project. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
8. As-built conditions of exterior skin and elevations shall be documented with an increased concentration of digital photographs as directed by the COR in order to capture pre-determined focal points, such as waterproofing, window flashing, radiused steel work, architectural or Exterior Insulation and Finish Systems (EIFS) detailing. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive elevations or elevation details.
9. As-built finished conditions of the interior of each building including floors, ceilings and walls shall be documented at certificate of occupancy or equivalent, or just prior to occupancy, or both, as directed by the COR. Overlapping photographic techniques shall be used to ensure maximum coverage. Indexing and navigation accomplished through interactive architectural drawings.
10. Miscellaneous events that occur during any Contractor site visit, or events captured by the Department of Veterans Affairs independently, shall be dated, labeled and inserted into a Section in the navigation structure entitled “Slideshows,” allowing this information to be stored in the same “place” as the formal scope.
11. Customizable project-specific digital photographic documentation of other details or milestones. Indexing and navigation accomplished through interactive architectural plans.
12. Monthly (29 max) exterior progressions (360 degrees around the project) and slideshows (all elevations and building envelope). The

slideshows allow for the inclusion of Department of Veterans Affairs pictures, aerial photographs, and timely images which do not fit into any regular monthly photopath.

13. Weekly (21 Max) Site Progressions - Photographic documentation capturing the project at different stages of construction. These progressions shall capture underground utilities, excavation, grading, backfill, landscaping and road construction throughout the duration of the project.
14. Regular (8 max) interior progressions of all walls of the entire project to begin at time of substantial framed or as directed by the COR through to completion.
15. Detailed Exact-Built of all Slabs for all project slab pours just prior to placing concrete or as directed by the COR.
16. Detailed Interior exact built overlapping photos of the entire building to include documentation of all mechanical, electrical and plumbing systems in every wall and ceiling, to be conducted after rough-ins are complete, just prior to insulation and or drywall, or as directed by COR.
17. Finished detailed Interior exact built overlapping photos of all walls, ceilings, and floors to be scheduled by COR prior to occupancy.
18. In event a greater or lesser number of images than specified above are required by the COR, adjustment in contract price will be made in accordance with clause entitled "CHANGES" (FAR 52.243-4).

C. Images shall be taken by a commercial photographer and must show distinctly, at as large a scale as possible, all parts of work embraced in the picture.

D. Coordination of photo shoots is accomplished through COR. Contractor shall also attend construction team meetings as necessary. Contractor’s operations team shall provide regular updates regarding the status of the documentation, including photo shoots concluded, the availability of new Progressions or Exact-Builts viewable on-line and anticipated future shoot dates.

E. Contractor shall provide all on-line domain/web hosting, security measures, and redundant server back-up of the documentation.

F. Contractor shall provide technical support related to using the system or service.

G. Upon completion of the project, final copies of the documentation (the "Permanent Record") with the indexing and navigation system embedded (and active) shall be provided in an electronic media format, typically a DVD or external hard-drive. Permanent Record shall have Building Information Modeling (BIM) interface capabilities. On-line access terminates upon delivery of the Permanent Record.

1.32 FINAL ELEVATION DIGITAL IMAGES

1.33 HISTORIC PRESERVATION

1.34 VA TRIRIGA CPMS

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SECTION 01 32 16.01
ARCHITECTURAL AND ENGINEERING CPM SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

The Architect/Engineer of Record (A/E) shall develop a Critical Path Method (CPM Schedule) plan and schedule demonstrating fulfillment of the contract requirements as designated in VA PG 18-15, shall keep the CPM 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. Conventional Critical Path Method (CPM) Precedence Diagramming Method (PDM) technique will be utilized to satisfy both time and cost applications. All schedule data and reports required under this specification section shall be based upon regular total float, not relative total float schedules.

1.2 A/E'S REPRESENTATIVE:

A. The A/E shall designate an authorized representative in the firm who will be responsible for the preparation of the CPM Schedule, review and report progress of the project with and to the Project Manager and the Contracting Officer.

B. The A/E's representative shall have direct project control and complete authority to act on behalf of the A/E in fulfilling the requirements of this specification section and such authority shall not be interrupted throughout the duration of the project.

1.3 A/E'S SCHEDULE PREPARATION:

A. To prepare the CPM Schedule, and subsequent periodic updates, which reflects the A/E's project plan, the A/E shall either designate a qualified individual within their firm or engage an independent CPM consultant (CPM Developer) who is skilled in the time and cost application of scheduling using (PDM) network techniques for Design projects, the cost of which is included in the A/E's bid.

B. Within 10 calendar days after award of the contract, the A/E shall submit to the Contracting Officer:

1. The name of the CPM Developer.
2. The Computer Software to be utilized.

3. Sufficient information to show that the CPM Developer has the qualifications to meet the requirements specified in the preceding paragraph.

C. The Contracting Officer has the right to approve or disapprove the designated CPM developer, and will notify the A/E of the VA decision within seven calendar days from receipt of information. In case of disapproval, the A/E shall resubmit another CPM Developer within 10 calendar days for renewed consideration. The A/E must have their CPM Developer approved prior to submitting the Initial CPM Schedule

1.4 COMPUTER PRODUCED SCHEDULES

A. The A/E shall provide to the VA Project Manager, Contracting Officer and CPM Schedule Analyst, monthly computer processing of all computer-produced time/cost schedules and reports generated from monthly project updates. A hard copy listing of all project schedule changes, and associated data, made at the update and an electronic file of this data. These reports shall be submitted with and substantively support the A/E's monthly payment request. The Project Manager shall identify the different report formats that the A/E shall provide based upon the monthly schedule updates.

B. The A/E is responsible for the correctness and timeliness of the computer-produced reports. The A/E is 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 shall report errors in computer-produced reports to the A/E's representative within ten calendar days from receipt of reports. The A/E will reprocess the computer-produced reports and associated compact disk(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 CPM SCHEDULE SUBMITTAL

A. Within 45 calendar days after receipt of Notice to Proceed, the A/E shall submit for the Project Manager and Contracting Officer's review; three blue line copies of the complete CPM Schedule on sheets of paper 765 x 1070 mm (30 x 42 inches) and an electronic file, (PDM) format. 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, duration, predecessor and successor relationships, area code, description, 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 and 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. The A/E shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the CPM Schedule. The Contracting Officer's separate approval of the CPM Schedule shall not excuse the A/E 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 CPM Schedule shall reflect the A/E's approach to scheduling the complete project. **The final CPM Schedule in its original form shall contain no contract modifications or changes which may have been incurred during the final CPM Schedule 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 CPM Schedule has been approved. The A/E 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.

B. Within 30 calendar days after receipt of the complete project CPM Schedule, the Project Manager of Contracting Officer will do one or both of the following:
   1. Notify the A/E concerning his actions, opinions, and objections.
   2. A meeting with the A/E at or near the job site for joint review, correction or adjustment of the proposed plan will be scheduled if required. Within 14 calendar days after the joint review, the A/E shall revise and shall submit three blue line copies of the revised CPM 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.

C. The approved baseline CPM Schedule and the corresponding computer-produced schedule(s) shall constitute the approved baseline schedule until subsequently revised in accordance with the requirements of this section.

1.6 WORK ACTIVITY/EVENT COST DATA

The A/E shall cost load all work activities. The cost loading shall reflect the appropriate level of effort of the work activities/events. 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 A/E 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 to assist him in determining approval or disapproval of the cost loading. In the event of disapproval, the A/E shall revise and resubmit in accordance with Article, THE COMPLETE PROJECT CPM SCHEDULE SUBMITTAL. Negative work activity/event cost data will not be acceptable, except on VA issued contract changes.

1.7 CPM SCHEDULE REQUIREMENTS

A. Show on the CPM Schedule the sequence and interdependence of work activities/events required for complete performance of all items of work. In preparing the CPM Schedule, the A/E shall:

1. Exercise sufficient care to produce a clear, legible and accurate CPM Schedule.
2. Show the following on each work activity/event:
   a. Activity/Event ID number.
   b. Concise description of the work represented by the activity/event. (35 characters or less including spaces preferred).
   c. Performance responsibility.
   d. Duration (in work days.)

e. Cost (in accordance with Article, ACTIVITY/EVENT COST DATA of this section and less than $99,999 per activity).

f. Manpower required (average number of men per day).

3. Show activities/events as:

a. A/E's time required for submittal of drawings.

b. VA review and approval of drawings, equipment schedules, samples, template, or similar items.

c. Interruption of VA Medical Center utilities, delivery of Government furnished equipment, project phasing and any other specification requirements.

4. Show activities/events for work for each discipline.

5. Break up the work into activities/events of duration no longer than 20 work days each, except for which the Project Manager and/or the Contracting Officer may approve the showing of a longer duration.

6. 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.

7. Uniquely number each activity/event with numbers ranging from 1 to 99998 only. The CPM Schedule should be generally numbered in such a way to reflect disciplines, phase or location of the work.

B. Submit the following supporting data in addition to the CPM Schedule, activity/event ID schedule and electronic file (s). Failure of the A/E to include this data will delay the review of the submittal until the Contracting Officer is in receipt of the missing data:

1. The proposed number of working days per week.

2. The holidays to be observed during the life of the contract (by day, month, and year).

C. To the extent that the CPM Schedule or any revised CPM Schedule shows anything not jointly agreed upon, it shall not be deemed to have been approved by the Contracting Officer. Failure to include any element of work required for the performance of this contract shall not excuse the A/E from completing all work required within any applicable completion date of each phase regardless of the Contracting Officer's approval of the CPM Schedule.

D. Compact Disk Requirements and CPM Activity/Event Record Specifications: Submit to the VA (Project Manager and CPM Schedule Analyst) an electronic file(s) containing one file of the data required.

1.8 PAYMENT TO THE A/E:

A. Monthly, the A/E shall submit the AIA application and certificate for payment documents G702 & G703 reflecting updated schedule activities and cost data. The A/E is entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated computer-produced calendar-dated schedule unless, in special situations, the Contracting Officer permits an exception to this requirement.

B. When the A/E fails or refuses to furnish to the Contracting Officer the information, which, in the sole judgment of the Contracting Officer, is necessary for processing the monthly progress payment, the A/E shall not be deemed to have provided an estimate and supporting schedule data upon which progress payment may be made.

1.9 PAYMENT AND PROGRESS REPORTING

A. Monthly progress meetings shall be held on dates mutually agreed to by the Project Manager and/or Contracting Officer and the A/E. The A/E shall update the project schedule and all other data required by this section shall be accurately filled in and completed prior to the monthly progress meeting. The A/E shall provide this information to VA three work days in advance of the progress meeting. Job progress will be reviewed to verify:

1. Actual start and/or finish dates for updated/completed activities/events.
2. Remaining duration, required to complete 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 CPM Schedule and computer-produced schedules. Changes in activity/event sequence and duration which have been made pursuant to the provisions of following Article, ADJUSTMENT OF CONTRACT COMPLETION.
4. Percentage for completed and partially completed activities/events.
5. Logic and duration revisions required by this section of the specifications.

6. Activity/event duration and percent complete shall be updated independently.

B. The A/E shall submit a narrative report as a part of his monthly review and update, in a form agreed upon by the A/E and the Contracting Officer. The narrative report shall include a description of problem areas; current and anticipated delaying factors and their estimated impact on performance of other activities/events and completion dates; and an explanation of corrective action taken or proposed.

C. After completion of the joint review and the Contracting Officer's approval of all entries, the A/E 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.

D. After completing the monthly schedule update, the A/E's scheduling person 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 A/E and Project Manager for the contract change(s). When there is a disagreement on logic and/or durations, the CPM Schedule update shall use the schedule logic and/or durations provided and approved by the Project Manager. 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 Contracting Officer's Representative 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 CPM Schedule is approved, the A/E must recreate all manual progress payment updates on this approved CPM Schedule 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.**

E. After VA acceptance and approval of the final CPM Schedule, and after each monthly update, the A/E shall submit to the Contracting Officer three blue line copies of a revised complete CPM Schedule showing all completed and partially completed activities/events, contract changes and logic changes made on the intervening updates or at the first update on the final diagram. The Contracting Officer may elect to have the A/E do this on a less frequent basis, but it shall be done on a quarterly basis as a minimum.

1.10 RESPONSIBILITY FOR COMPLETION

A. Whenever it becomes apparent from the current monthly progress review meeting or the monthly schedule that phasing or contract completion dates will not be met, the A/E shall execute some or all of the following remedial actions:
   1. Increase manpower in such quantities and discipline as necessary to eliminate the backlog of work.
   2. Increase the number of working hours 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 A/E shall notify and obtain approval from the Project Manager and/or the Contracting Officer for the proposed schedule changes. If such actions are approved, the CPM revisions shall be incorporated by the A/E into the CPM Schedule before the next update, at no additional cost to the Government.

1.11 CHANGES TO CPM SCHEDULE AND SCHEDULE

A. Within 30 calendar days after VA acceptance and approval of any updated computer-produced schedule, the A/E will submit a revised CPM Schedule

B. Contracting Officer's approval for the revised CPM 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 or the VA representative.

D. The cost of revisions to the CPM Schedule resulting from contract changes will be included in the proposal for changes in work as specified in Article, FAR 52.243 -4 (CHANGES), 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 CPM Schedule not resulting from contract changes is the responsibility of the A/E .

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 A/E shall be supported with a justification, CPM data and supporting evidence as the Contracting Officer may deem necessary for determination as to whether or not the A/E 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 A/E has used, in full, all the float time available for the work involved in this request. The Contracting Officer'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 will within a reasonable time after receipt of such justification and supporting evidence, review the facts and advise the A/E in writing of the Contracting Officer's decision.

C. The A/E shall submit each request for a change in the contract completion date to the Contracting Officer in accordance with the provisions specified under Article, FAR 52.243 -4 (CHANGES). The A/E 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 CPM Schedule.

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.

1.13 PROJECT DESIGN SCHEDULE RISK ANALYSIS/MITIGATION PLAN

A. Schedule Risk Analysis – The A/E shall conduct the statistical schedule risk analysis based on the above detailed construction activities in the Day 1 approved diagram, identifying major schedule risk areas and recommended risk mitigation plans as outlined below.

B. The risk analysis shall be conducted by a person or firm skilled in the statistical method of schedule risk analysis based on the (PDM) CPM Schedule techniques for major projects, preferably in the major health care related projects. The cost of this service shall be included in the A/E's proposal.

C. The Contracting Officer has the right to approve or disapprove the Person or firm designated to perform the risk analysis.

1.14 RISK ANALYSIS FORMAT / REQUIREMENTS / SUBMITALS

A. Risk Analysis Software / Format - Within 45 calendar days after receipt of Notice to Proceed, the A/E shall submit for the Contracting Officer's review; a Risk Analysis software to be utilized, the method of performing the analysis, the format of presenting the data and the reports for VA approval.

B. Conduct Risk Analysis **/ Submittals - Based on the approved software / format, the consultant shall** perform statistical risk analysis on the detailed approved Day 1 diagram. The A/E shall review and utilize any previous Risk analysis based on the "semi-detailed" schedule logic and schedule to ensure the continuity of previous schedule risk analysis. The A/E's project manager shall identify the major schedule risk areas and possible risk mitigation strategy/plan and record it in a narrative format, with **electronic file submission** to VA. **The risk analysis exercise shall be performed or updated at least on a quarterly basis or as directed by the VA Contracting officer.**

C. The submittal shall include three copies of a computer-produced risk analysis results, predicting the various meaningful probability curves of achieving the contract schedules. It shall also include a detailed narrative list of all major and minor potential and specific schedule and cost risk areas, and a A/E 's recommendations of mitigating the identified risks which must be addressed by the VA Project and Contracting Officer's Representative teams to maintain the contract schedule.

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01-01-24

SECTION 01 32 16.15
PROJECT SCHEDULES
(SMALL PROJECTS – DESIGN/BID/BUILD)

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 (COTR).

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 COTR, 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 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; 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 COTR 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 45 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. The contractor shall make a separate written detailed request to the Contracting Officer identifying these date constraints and secure the Contracting Officer's written approval before incorporating them into the network diagram. The Contracting Officer'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.

B. Within 30 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 14 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.

C. 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.

D. The Complete Project Schedule shall contain approximately _____work activities/events.

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 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 852.232 –Article 70 Without NAS-CPM for (PAYMENTS UNDER FIXED PRICE CONSTRUCTION).

C. In accordance with FAR 52.236 – 1 (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's and Architect-Engineer's review and approval of shop drawings, equipment schedules, samples, template, or similar items.
   c. Interruption of VA Facilities utilities, delivery of Government furnished equipment, and rough-in drawings, project phasing and any other specification requirements.
   d. Test, balance and adjust various systems and pieces of equipment, 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 area, floor, or building, to another area, floor, or building, for at least five 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, concrete and asphalt curing) and any other activities/events for which the COTR 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 either 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 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 COTR. 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 COTR’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 VA Form 10-6001a 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 852.232 –

Article 70 Without NAS-CPM for (PAYMENTS UNDER FIXED PRICE CONSTRUCTION). 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 COTR 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 COTR three 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, RE office representatives, and all subcontractors needed, as determined by the SRE, 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 COTR 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 30 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'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 or the VA 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 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 COTR 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'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 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'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). 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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11-01-23

SECTION 01 33 23

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 – GENERAL

1.1 DESCRIPTION

A. This specification defines the general requirements and procedures for submittals. A submittal is information submitted for VA review to establish compliance with the contract documents.

B. Detailed submittal requirements are found in the technical sections of the contract specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective technical specifications at no additional cost to the government.

C. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

1.2 DEFINITIONS

A. Preconstruction Submittals: Submittals which are required prior to issuing contract notice to proceed or starting construction. For example, Certificates of insurance; Surety bonds; Site-specific safety plan; Construction progress schedule; Schedule of values; Submittal register; List of proposed subcontractors.

B. Shop Drawings: Drawings, diagrams, and schedules specifically prepared to illustrate some portion of the work. Drawings prepared by or for the Contractor to show how multiple systems and interdisciplinary work will be integrated and coordinated.

C. Product Data: Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions, and brochures, which describe and illustrate size, physical appearance, and other characteristics of materials, systems, or equipment for some portion of the work. Samples of warranty language when the contract requires extended product warranties.

D. Samples: Physical examples of materials, equipment, or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged. Color samples from the manufacturer's standard line (or custom color samples if specified) to be used in selecting or approving colors for the project. Field samples and mock-ups constructed to establish standards by which the ensuing work can be judged.

E. Design Data: Calculations, mix designs, analyses, or other data pertaining to a part of work.

F. Test Reports: Report which includes findings of a test required to be performed by the Contractor on an actual portion of the work. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

G. Certificates: Document required of Contractor, or of a manufacturer, supplier, installer, or subcontractor through Contractor. The purpose is to document procedures, acceptability of methods, or personnel qualifications for a portion of the work.

H. Manufacturer's Instructions: Pre-printed material describing installation of a product, system, or material, including special notices and MSDS concerning impedances, hazards, and safety precautions.

I. Manufacturer's Field Reports: Documentation of the testing and verification actions taken by manufacturer's representative at the job site on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must indicate whether the material, product, or system has passed or failed the test.

J. Operation and Maintenance Data: Manufacturer data that is required to operate, maintain, troubleshoot, and repair equipment, including manufacturer's help, parts list, and product line documentation. This data shall be incorporated in an operations and maintenance manual.

K. Closeout Submittals: Documentation necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a phase of construction on a multi-phase contract.

1.3 SUBMITTAL REGISTER

A. The submittal register will list items of equipment and materials for which he contract documents but which have been omitted from the submittal register.

B. The submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.

C. The VA will provide a blank submittal register in electronic format. Thereafter, the Contractor shall fill in the blank register with the required submittals as documented in the project spec. The Contractor shall track all submittals by maintaining a complete list, including completion of all data columns, including dates on which submittals are received and returned by the VA.

D. Blank digital register provided for Contractor use below



ENG_FORM_4288-R.pdf

D. The Contractor shall update the submittal register as submittal actions occur and maintain the submittal register at the project site until final acceptance of all work by Contracting Officer.

E. The Contractor shall submit formal monthly updates to the submittal register in electronic format. Each monthly update shall document actual submission and approval dates for each submittal.

1.4 SUBMITTAL SCHEDULING

A. Submittals are to be scheduled, submitted, reviewed, and approved prior to the acquisition of the material or equipment.

B. Coordinate scheduling, sequencing, preparing, and processing of submittals with performance of work so that work will not be delayed by submittal processing. Allow time for potential resubmittal.

C. No delay costs or time extensions will be allowed for time lost in late submittals or resubmittals.

D. All submittals are required to be approved prior to the start of the specified work activity.

1.5 SUBMITTAL PREPARATION

A. Each submittal is to be complete and in sufficient detail to allow ready determination of compliance with contract requirements.

B. Collect required data for each specific material, product, unit of work, or system into a single submittal. Prominently mark choices, options, and portions applicable to the submittal. Partial submittals will not be accepted for expedition of construction effort. Submittal will be returned without review if incomplete.

C. If available product data is incomplete, provide Contractor-prepared documentation to supplement product data and satisfy submittal requirements.

D. All irrelevant or unnecessary data shall be removed from the submittal to facilitate accuracy and timely processing. Submittals that contain the excessive amount of irrelevant or unnecessary data will be returned without review.

E. Provide a transmittal form for each submittal with the following information:

1. Project title, location and number.
2. Construction contract number.
3. Date of the drawings and revisions.
4. Name, address, and telephone number of subcontractor, supplier, manufacturer, and any other subcontractor associated with the submittal.
5. List paragraph number of the specification section and sheet number of the contract drawings by which the submittal is required.
6. When a resubmission, add alphabetic suffix on submittal description. For example, submittal 18 would become 18A, to indicate resubmission.
7. Product identification and location in project.

F. The Contractor is responsible for reviewing and certifying that all submittals are in compliance with contract requirements before submitting for VA review. Proposed deviations from the contract requirements are to be clearly identified. All deviations submitted must include a side by side comparison of item being proposed against item specified. Failure to point out deviations will result in the VA

requiring removal and replacement of such work at the Contractor's expense.

G. Stamp, sign, and date each submittal transmittal form indicating action taken.

H. Stamp used by the Contractor on the submittal transmittal form to certify that the submittal meets contract requirements is to be similar to the following:

CONTRACTOR
(Firm Name)
_____Approved
_____Approved with corrections as noted on submittal data and/or attached sheets(s)
SIGNATURE: _____
TITLE: _____
DATE: _____

1.6 SUBMITTAL FORMAT AND TRANSMISSION

A. Provide submittals in electronic format, with the exception of material samples. Use PDF as the electronic format, unless otherwise specified or directed by the Contracting Officer.

B. Compile the electronic submittal file as a single, complete document. Name the electronic submittal file specifically according to its contents.

C. Electronic files must be of sufficient quality that all information is legible. Generate PDF files from original documents so that the text included in the PDF file is both searchable and can be copied. If documents are scanned, Optical Character Resolution (OCR) routines are required.

D. E-mail electronic submittal documents smaller than 5MB in size to e-mail addresses as directed by the Contracting Officer.

E. Provide electronic documents over 5MB through an electronic FTP file sharing system. Confirm that the electronic FTP file sharing system can be accessed from the VA computer network. The Contractor is responsible for setting up, providing, and maintaining the electronic FTP file sharing system for the construction contract period of performance.

F. Provide hard copies of submittals when requested by the Contracting Officer. Up to 3 additional hard copies of any submittal may be requested at the discretion of the Contracting Officer, at no additional cost to the VA.

1.7 SAMPLES

A. Submit two sets of physical samples showing range of variation, for each required item.

B. Where samples are specified for selection of color, finish, pattern, or texture, submit the full set of available choices for the material or product specified.

C. When color, texture, or pattern is specified by naming a particular manufacturer and style, include one sample of that manufacturer and style, for comparison.

D. Before submitting samples, the Contractor is to ensure that the materials or equipment will be available in quantities required in the project. No change or substitution will be permitted after a sample has been approved.

E. The VA reserves the right to disapprove any material or equipment which previously has proven unsatisfactory in service.

F. Physical samples supplied maybe requested back for use in the project after reviewed and approved.

1.8 OPERATION AND MAINTENANCE DATA

A. Submit data specified for a given item within 30 calendar days after the item is delivered to the contract site.

B. In the event the Contractor fails to deliver O&M Data within the time limits specified, the Contracting Officer may withhold from progress

payments 50 percent of the price of the item with which such O&M Data are applicable.

1.9 TEST REPORTS

COR may require specific test after work has been installed or completed which could require contractor to repair test area at no additional cost to contract.

1.10 VA REVIEW OF SUBMITTALS AND RFIS

A. The VA will review all submittals for compliance with the technical requirements of the contract documents. The Architect-Engineer for this project will assist the VA in reviewing all submittals and determining contractual compliance. Review will be only for conformance with the applicable codes, standards and contract requirements.

B. Period of review for submittals begins when the VA COR receives submittal from the Contractor.

C. Period of review for each resubmittal is the same as for initial submittal.

D. VA review period is 15 business days for submittals.

E. VA review period is 10 business days for RFIs.

F. The VA will return submittals to the Contractor with the following notations:

1. "Approved": authorizes the Contractor to proceed with the work covered.
2. "Approved as noted": authorizes the Contractor to proceed with the work covered provided the Contractor incorporates the noted comments and makes the noted corrections.
3. "Disapproved, revise and resubmit": indicates noncompliance with the contract requirements or that submittal is incomplete. Resubmit with appropriate changes and corrections. No work shall proceed for this item until resubmittal is approved.
4. "Not reviewed": indicates submittal does not have evidence of being reviewed and approved by Contractor or is not complete. A submittal marked "not reviewed" will be returned with an explanation of the reason it is not reviewed. Resubmit submittals after taking appropriate action.

1.11 APPROVED SUBMITTALS

A. The VA approval of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing, and other information are satisfactory.

B. VA approval of a submittal does not relieve the Contractor of the responsibility for any error which may exist. The Contractor is responsible for fully complying with all contract requirements and the satisfactory construction of all work, including the need to check, confirm, and coordinate the work of all subcontractors for the project. Non-compliant material incorporated in the work will be removed and replaced at the Contractor's expense.

C. After submittals have been approved, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

D. Retain a copy of all approved submittals at project site, including approved samples.

1.12 WITHHOLDING OF PAYMENT

Payment for materials incorporated in the work will not be made if required approvals have not been obtained.

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SECTION 01 35 26

SAFETY REQUIREMENTS

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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 Professionals (ASSP):

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

Z359.0-2012.....Definitions and Nomenclature Used for Fall Protection and Fall Arrest

Z359.1-2016.....The Fall Protection Code

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):

10-2022.....Standard for Portable Fire Extinguishers

30-2024.....Flammable and Combustible Liquids Code

51B-2024.....Standard for Fire Prevention During Welding, Cutting and Other Hot Work

70-2023.....National Electrical Code

70B-2023.....Recommended Practice for Electrical Equipment Maintenance

70E-2024 .....Standard for Electrical Safety in the Workplace

241-2022.....Standard for Safeguarding Construction, Alteration, and Demolition Operations

703-2024.....Standard for Fire Retardant–Treated Wood and Fire-Retardant Coatings for Building Materials

F. The Joint Commission (TJC)

TJC Manual .....Comprehensive Accreditation and Certification Manual

G. U.S. Nuclear Regulatory Commission

10 CFR 20 .....Standards for Protection Against Radiation

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

29 CFR 1904 .....Reporting and Recording Injuries & Illnesses

29 CFR 1910 .....Safety and Health Regulations for General Industry

29 CFR 1926 .....Safety and Health Regulations for Construction Industry

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

I. US Army Corps of Engineers Safety and Occupational Health (SOH) Requirements Publication No. EM 385-1-1, 2024 edition

1.2 DEFINITIONS:

A. Critical Lift. A lift with the hoisted load exceeding 75% of the crane’s maximum capacity; lifts made out of the view of the operator (blind picks); lifts involving two or more cranes; personnel being

hoisted; and special hazards such as lifts over occupied facilities, loads lifted close to power-lines, and lifts in high winds or where other adverse environmental conditions exist; and any lift which the crane operator believes is critical.

B. 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)).

C. Competent Person, Confined Space
The CP, Confined Space, is a person meeting the competent person requirements as defined EM 385-1-1 Appendix Q, with thorough knowledge of OSHA's Confined Space Standard, 29 CFR 1910.146, and designated in writing to be responsible for the immediate supervision, implementation and monitoring of the confined space program, who through training, knowledge and experience in confined space entry is capable of identifying, evaluating and addressing existing and potential confined space hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

D. Competent Person, Cranes and Rigging.
The CP, Cranes and Rigging, as defined in EM 385-1-1 Appendix Q, is a person meeting the competent person, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the Crane and Rigging Program, who through training, knowledge and experience in crane and rigging is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures regarding such hazards.

E. Competent Person, Excavation/Trenching.
A CP, Excavation/Trenching, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and 29 CFR 1926, who has been designated in writing to be responsible for the immediate supervision, implementation and monitoring of the

excavation/trenching program, who through training, knowledge and experience in excavation/trenching is capable of identifying, evaluating and addressing existing and potential hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

F. Competent Person, Fall Protection

The CP, Fall Protection, is a person meeting the competent person requirements as defined in EM 385-1-1 Appendix Q and in accordance with ASSE/SAFE Z359.0, who has been designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the fall protection program, who through training, knowledge and experience in fall protection and rescue systems and equipment, is capable of identifying, evaluating and addressing existing and potential fall hazards and, who has the authority to take prompt corrective measures with regard to such hazards.

G. Competent Person, Scaffolding

The CP, Scaffolding is a person meeting the competent person requirements in EM 385-1-1 Appendix Q and designated in writing by the employer to be responsible for immediate supervising, implementing and monitoring of the scaffolding program. The CP for Scaffolding has enough training, knowledge and experience in scaffolding to correctly identify, evaluate and address existing and potential hazards and has the authority to take prompt corrective measures with regard to these hazards. CP qualifications must be documented and include experience on the specific scaffolding systems/types being used, assessment of the base material that the scaffold will be erected upon, load calculations for materials and personnel, and erection and dismantling. The CP for scaffolding must have a documented, minimum of 8-hours of scaffold training to include training on the specific type of scaffold being used (e.g. mast-climbing, adjustable, tubular frame), in accordance with EM 385-1-1 Section 22.B.02.

H. Competent Person (CP) Trainer

A competent person trainer as defined in EM 385-1-1 Appendix Q, who is qualified in the material presented, and who possesses a working knowledge of applicable technical regulations, standards, equipment and systems related to the subject matter on which they are training Competent Persons. A competent person trainer must be familiar with the typical hazards and the equipment used in the industry they are instructing. The training provided by the competent person trainer must be appropriate to that specific industry. The competent person trainer must evaluate the knowledge and skills of the competent persons as part of the training process.

I. High Risk Activities

High Risk Activities are activities that involve work at heights, crane and rigging, excavations and trenching, scaffolding, electrical work, and confined space entry.

J. "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.

K. Qualified Person, Fall Protection (QP for FP)

A QP for FP is a person meeting the requirements of EM 385-1-1 Appendix Q, and ASSE/SAFE Z359.0, with a recognized degree or professional certificate and with extensive knowledge, training and experience in the fall protection and rescue field who is capable of designing, analyzing, and evaluating and specifying fall protection and rescue systems.

L. USACE Property and Equipment

Interpret "USACE" property and equipment specified in USACE EM 385-1-1 as Government property and equipment.

M. High Visibility Accident. Any mishap which may generate publicity or high visibility.

N. Mishap: Mishap in this specification is defined according to the EM 385-1-1. A mishap is any unplanned, undesired event that occurs during the course of work being performed. This includes accidents, incidents, and near misses.

O. Mishap Criticality Categories

1. No impact/Near-Miss – near miss incidents that shall be investigated and reported to the VA within 24 hours.

2. Minor incident/impact – incidents that require first aid or result in minor equipment damage (less than $5000). These incidents must be investigated and reported to the VA within 24 hours.

3. Moderate incident/impact – Any work-related injury or illness that results in any of the following. These incidents must be investigated and are required to be reported to the VA within 2 hours.

   a. Days away from work (any time lost after day of injury/illness onset);

   b. Restricted work;

   c. Transfer to another job;

   d. Medical treatment beyond first aid;

   e. Loss of consciousness;

   f. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (5) above or,

   g. any incident that leads to major equipment damage (greater than $5000).

4. Major incident/impact – Any mishap that leads to fatalities, hospitalizations, amputations, and losses of an eye as a result of contractors' activities. Or any incident which leads to major property damage (greater than $20,000) and/or may generate

publicity or high visibility. These incidents must be investigated and are required to be reported to the VA as soon as practical, but not later than 2 hours after the incident.

P. Load Handling Equipment (LHE)
LHE is a term used to describe cranes, hoists and all other hoisting equipment (hoisting equipment means equipment, including crane, derricks, hoists and power operated equipment used with rigging to raise, lower or horizontally move a load).

Q. 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 physician or registered personnel.

1.3 SUBMITTAL REQUIRMENTS:

A. Government approval or concurrence is required for submittals with a "G" designation; submittals not having a "G" designation are submitted for information only.

B. Preconstruction Submittals

1. Accident Prevention Plan (APP); G

C. Reports

1. Monthly Contractor Health Safety and Environmental (HS&E) Performance Report; G

2. Notifications and Reports;

3. Mishap Reports;

4. Near-Miss Reports;

5. LHE Inspection Reports

6. Monthly Exposure Hour Reports;

D. Work Plans

1. Standard Lift Plan; G

2. Critical Lift Plan; G

3. Activity Hazard Analysis (AHA); G

4. Confined Space Entry Permit

5. Hot Work Permit

6. Radiography Operation Planning Work Sheet; G

7. Portable Gauge Operations Planning Worksheet; G

E. Certificates

1. Contractor Safety Self-Evaluation Checklist

2. Crane Operators/Riggers Certifications; G

3. Certificate of Compliance

4. Mobile Cranes Inspection Certificate

5. License Certificates

6. Machinery & Mechanized Equipment Certification Form

1.4 REGULATORY REQUIREMENTS:

A. In addition to the detailed requirements included in the provisions of this contract, comply with the most recent edition of USACE EM 385-1-1, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSP A10.34, and all applicable federal, state, and local laws, ordinances, criteria, rules and regulations. 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 or Government Designated Authority.

1.5 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 Mishap 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. Specifically articulating the safety requirements found within these VA contract safety specifications and the latest version of the United States Army Corps of Engineers – Safety and Occupational Health (SOH) Requirements - EM 385-1-1 Manual. Model language and format can be found in Appendix A of the EM 385-1-1 Manual

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. The Statement of Safety and Health Policy must be signed by a company executive.

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 or EM 385-1-1 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 Construction Outreach training within the past five years is required for all workers on site and the OSHA 30-hour Construction Outreach training within the past five years 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)

h. **MISHAP INVESTIGATION & REPORTING.**

1) The APP shall include identify person(s) responsible to provide the following to the Contracting Officer Representative:

1. Monthly HS&E Performance Report (Exposure Hours Data);

2. Mishap investigation reports;

3. Project site injury and illness logs;

4. Near-Miss reports;

i. **PLANS (PROGRAMS, PROCEDURES) REQUIRED.** Based on a risk assessment of contracted activities and on mandatory OSHA and/or EM 385-1-1 compliance programs, the Contractor shall address all applicable occupational, patient, and public safety risks in site-specific compliance and accident prevention plans. These Plans shall include but are not limited to procedures for addressing the risks associated 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 (LOTO);

14) Site-Specific Fall Protection & Prevention;

15) Excavation/trenching;

16) Asbestos abatement;

17) Lead abatement;

18) Crane Critical lift;

19) Respiratory protection;

20) Health hazard control program;

21) Radiation Safety Program;

22) Abrasive blasting;

23) Heat/Cold Stress Monitoring;

24) Crystalline Silica Monitoring (Assessment);

25) Demolition plan (to include engineering survey);

26) Formwork and shoring erection and removal;

27) Pre-Cast Concrete;

28) Public (Mandatory compliance with ANSI/ASSP A10.34-2012);

29) Sub-contractor or cross-trade coordination;

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 safety 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 in accordance with FAR Clause 52.236-13, *Accident Prevention*, 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 Contracting Officer Representative or Government Designated Authority. 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 within 2 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions to safeguard onsite personnel, visitors, the public and the environment.

1.6 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 or Government Designated Authority 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, excavations, scaffolding, fall protection, other activities as specified by OSHA, EM 385-1-1, 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 weekly) 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 or Government Designated Authority for review for compliance.

1.7 PRECONSTRUCTION SAFETY 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 pre-construction safety 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.

1.8 SAFETY MEETINGS:

Conduct safety meetings to review past activities, plan for new or changed operations, review pertinent aspects of appropriate AHA (by trade), establish safe working procedures for anticipated hazards, and provide pertinent Safety and Occupational Health (SOH) training and motivation. Conduct meetings at least once a month for all supervisors

on the project location. The SSHO, supervisors, foremen, or CDSOs must conduct meetings at least once a week for the trade workers. Document meeting minutes to include the date, persons in attendance, subjects discussed, and names of individual(s) who conducted the meeting. Maintain documentation on-site and furnish copies to the Contracting Officer on request. Notify the Contracting Officer of all scheduled meetings 7 calendar days in advance.

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

A. The Prime Contractor shall provide a Safety oversight team that includes a minimum of one (1) person at each project site, for each shift, to function as the Site Safety and Health Officer (SSHO). The Prime Contractor shall provide a minimum of one "Full-Time" SSHO at each project site, for each shift (with no other duties) that holds as current, a professional safety certification with at least 3 years of dedicated construction safety related experience. The SSHO shall ensure that the requirements of the VA and of 29 CFR 1926.16 are met for the project. The SSHO must be at the work site at all times, during construction activities, to implement and administer the Contractor's safety program and government-accepted Accident Prevention Plan. If the SSHO is off-site for a period longer than 8 hours, or one shift, and not exceeding 40 hours, or 5 shifts, a pre-approved Alternate Safety Officer shall be provided and shall fulfill the same roles and responsibilities as the primary SSHO. The Alternate Safety Officer shall have the required training, experience, and qualifications in accordance with EM 385-1-1 Section 01.A.17, and all associated sub-paragraphs. When the SSHO is temporarily (not to exceed 8 hours) off-site, a Designated Representative (DR) from the Prime Contractors' staff, as identified in the AHA may be used in lieu of an Alternate Safety Officer and shall be on the project site, at all times, when work is being performed. Note that the DR is a collateral duty safety position, with safety duties in addition to their full-time occupation. 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, Scaffolds, and Trenches/Excavations).

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, Scaffolds, and Trenches/Excavations). However, the SSHO has be a separate qualified individual from the Prime Contractor's Superintendent and/or Quality Control Manager with duties only as the SSHO

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).

1.10 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.

B. As a minimum the SSHO must have completed the OSHA 30-hour Construction Safety Outreach class within the past five (5) years and:

1. Seven (7) years of construction industry safety related experience.

2. OR have a safety and health degree from an accredited university or college and five (5) years of construction industry safety related experience

3. OR hold as current, a Certified Safety Professional (CSP) or a Construction Health and Safety Technician (CHST) certification and five (3) years of construction industry safety related experience.

C. The Alternate Safety Officer shall meet, at a minimum, the requirements of EM 385-1-1 Section 1 and have five (5) years of construction industry safety experience If the SSHO does not have a current certification, certification must be obtained within 90 days, maximum, of contract award.

D. All designated CPs shall have completed the OSHA 30-hour Construction Safety course and/or EM 385-1-1 40-hour training within the past 5 years. In addition, 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, scaffolds, and trenches/excavations) shall have a specialized formal course in the hazard recognition and control associated with those high hazard work operations. Documented “repeat” deficiencies in the execution of safety requirements will require retaking the requisite formal course.

E. All other construction workers shall have the OSHA 10-hour Construction Safety Outreach course within the past 5 years and any necessary safety training to be able to identify hazards within their work environment.

F. Submit training records associated with the above training requirements to 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 safety conference for acceptance.

G. 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 COR that individuals have undergone contractor's safety briefing.

H. Ongoing safety training will be accomplished in the form of weekly documented safety meeting.

1.11 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 their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection with a written report 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 shall be one that is not a part of the immediate site project team. The individual can be a corporate safety professional or independently contracted who is not an immediate member of the construction project site team. 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.

1.12 MISHAPS, OSHA 300 LOGS, AND EXPOSURE-HOURS:

A. The prime contractor shall establish and maintain a Near-Miss and Mishap reporting, recordkeeping, and analysis system to track and analyze all injuries and illnesses, high visibility incidents, and accidental property damage (both government and contractor) that occur on site. Notify and provide an initial report to the Contracting Officer Representative as soon as practical, but no more than two hours after any Moderate or Major Mishap, High Visibility Incidents, or any weight handling and hoisting equipment mishap. No Impact/Near-Miss and Minor Mishaps shall be reported within 24 hours or as soon as practical. Within the notification the sender shall include contractor name; contract title; type of contract; name of activity, installation or location where mishap 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 mishap (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the Mishap site until the Contracting Officer Representative determines whether a government investigation will be conducted.

B. Conduct a mishap investigation for all Mishaps including mishaps resulting in at least $20,000 in damages without injury, to establish the root cause(s) of the mishap. The Mishap investigation shall include images, 5 whys, the injured person’s firsthand account, any witness accounts, methods of procedures, related AHA to the task, and corrective action plan signed by the president, vice president, or appropriate corporate-level leadership identified in the company’s org chart for the project. Additionally, complete the VA Form 2162 (or equivalent) and provide the report to the Contracting Officer Representative within 7 calendar days of the accident. The Contracting

Officer Representative will provide copies of any required or special forms.

C. A summation of all exposure-hours worked by the contractor and associated sub-contractors for each month will be reported to Contracting Officer Representative no later than the 10th day of the following month.

D. A summation of all Minor, Moderate, and Major incidents 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 upon request.

1.13 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. Any PPE above and beyond the Mandatory PPE identified below and determined by the Contracting Officer or their Representative to be necessary in the performance of the Governments duties relative to this contract, shall be provided to the Government upon written notification by the Contracting Officer and at no additional expense to the Government. All PPE provided to the Government shall also be accompanied by any relevant or required training necessary to ensure its proper use.

C. Mandatory Minimum 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 and/or EM 385-1-1 regulations.

2. Safety glasses - unless written authorization is given by the Contracting Officer Representative in circumstances of no eye hazards, 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 Contracting Officer Representative in circumstances of no foot hazards.

4. Hearing protection - Use personal hearing protection at all times in designated noise hazardous areas or when performing noise hazardous tasks.

5. High-visibility Safety Apparel – appropriate brightly colored clothing that feature some type of reflective material on them, such as safety vests, shall be worn by personnel or visitors on construction sites.

1.14 PRE-CONSTRUCTION RISK ASSESSMENT

A. Control of all construction-associated hazards that affect VA medical facilities, their occupants, services and mission-essential functions and capabilities is critical in all medical center facilities. VHA Pre-Construction Risk Assessments (PCRAs) for construction, renovation and maintenance projects are included with this contract solicitation with required mitigations of identified hazards. VHA-PCRAs will be re-validated and updated as needed based on but not limited to changes from original designs, affected individuals, areas/locations, scope, contractor means and methods, safety requirements, phasing, contractor competencies and capabilities.

B. Infection Prevention and 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. A detailed analysis of potential risks for infectious disease transmission affecting the care, treatment or

services of patients or residents has been conducted. VHA Infection Control Risk Assessments (ICRAs) are included with this contract solicitation with required mitigation actions/activities. VHA-ICRAs will be re-validated and updated as needed based on changes in original designs, affected individuals, area(s) or location(s), scope, contractor means and methods, infection prevention and control requirements, differing site conditions, phasing, contractor competencies and capabilities, and infectious disease outbreaks.

C. For work occurring at a VA medical facility, coordinate with the facility Safety Manager/Officer, as several aspects of this section directly relate to infection control risk assessments required in or adjacent to construction affecting occupied buildings accredited by The Joint Commission.

D. Products and Materials:

1. Sheet Plastic: Fire retardant polyethylene, 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: EPA-registered, Hospital-approved disinfectant or equivalent product

8. Portable Ceiling Access Module

1.15 DUST CONTROL

A. Contractor shall verify that dust will not be introduced into the facility through intake vents or building openings. HEPA filtration on intake vents is required where dust may be introduced.

B. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary.

C. 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.

1.16 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.

1.17 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. For work occurring at a VA medical facility, coordinate with the facility Safety Manager/Officer, as several aspects of this section directly relate to interim life safety measures required in or adjacent to construction affecting occupied buildings accredited by The Joint Commission.

D. 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).

E. Temporary Construction Partitions:

1. Install and maintain temporary construction partitions to provide smoke-tight separations between the areas that are described in phasing requirements and adjoining areas. Construct partitions of gypsum board or fire-retardant treated plywood (fire-retardant treated in accordance with NFPA 703) on both sides of fire-retardant

treated wood framing or metal steel studs. Extend the partitions through suspended ceilings to floor slab deck or roof. Seal joints and penetrations. At door openings, install Class C, ¾ hour fire/smoke rated doors with self-closing devices.

2. Install one-hour fire-rated temporary construction partitions as shown on drawings to maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures.

3. Close openings in smoke barriers and fire-rated construction to maintain fire ratings. Seal penetrations with listed through-penetration firestop materials in accordance with Section 07 84 00, FIRESTOPPING.

F. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.

G. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer Representative.

H. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer Representative.

I. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.

J. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.

L. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.

M. 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 COR.

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

O. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with COR. Obtain permits from COR at least __48__ hours in advance.

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

Q. 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.

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

1.18 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 when 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 and permit specific to energized work activities will be developed, reviewed, and accepted by the VA prior to the start of that activity.

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 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 alterative and it is strongly

suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity and permit for energized work has been reviewed and 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. GFCI protection shall be provided where an employee is operating or using cord- and plug-connected tools related to construction activity supplied by 125-volt, 15-, 20-, or 30-ampere circuits. Where employees operate or use equipment supplied by greater than 125-volt, 15-, 20-, or 30- ampere circuits, GFCI protection or an assured equipment grounding conductor program shall be implemented in accordance with NFPA 70E - 2015, Chapter 1, Article 110.4(C)(2).

1.19 FALL PROTECTION

A. The fall protection (FP) threshold height requirement is 4ft for ALL WORK in government occupied sites, unless the OSHA 29 CFR 1926 or EM 385-1-1 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work. For work occurring at new “greenfield” sites or sites with 24/7 Contractor controlled 100% restricted access, the fall protection (FP) threshold height may be increased to 6ft unless the OSHA 29 CFR 1926 or EM 385-1-1 requirements are more stringent.

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 more stringent of OSHA and EM 385-1-1 requirements.

1.20 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 4 ft 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.

1.21 EXCAVATION AND TRENCHES

1.22 CRANES

A. All crane work shall comply with 29 CFR 1926 Subpart CC and EM 385-1-1.

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.

C. A detailed lift plan for all lifts shall be submitted to the COR and/or other Government Designated Authority 14 days prior to the scheduled lift complete with route for truck carrying load, crane load analysis, siting of crane and path of swing and all other elements of a critical lift plan where the lift meets the definition of a critical lift. Critical lifts require a more comprehensive lift plan to minimize the potential of crane failure and/or catastrophic loss. The plan must be reviewed and accepted by the General Contractor before being submitted to the VA for review. The lift will not be allowed to proceed without prior acceptance of this document by the COR.

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 or more floors are vacated under the lift affected area AND a Contractor provided engineering analysis, performed by a Professional Engineer, demonstrates that overhead protection provided by the roof and vacated floors is sufficient to protect against the potential loss of a load being lifted or a minimum of 300 psf of protection is provided, whichever is greater

b. OR Overhead protection is designed by a Professional Engineer and installed over the roof by the Contractor to protect the occupants below. The installed system shall be sufficient to protect against the potential loss of a load being lifted or a minimum of 300 psf of protection is provided, whichever is greater.

c. OR A formal request may be submitted to the Contracting Officer for documentation, if available, indicating the roof of the building has been previously designed and constructed using a reinforced concrete roof slab or other means to provide overhead protection from construction activities specifically associated with the vertical or horizontal expansion of the same building AND a Contractor provided engineering analysis, performed by a Professional Engineer, demonstrates that overhead protection provided by the roof is sufficient to protect against the potential loss of a load being lifted or a minimum of 300 psf of protection is provided, whichever is greater.

1.23 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.

1.24 CONFINED SPACE ENTRY

A. All confined space entry shall comply with 29 CFR 1926, Subpart AA 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 COR.

1.25 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 COR. Obtain permits from COR at least ___24_ hours in advance.

1.26 LADDERS

A. All Ladder use shall comply with 29 CFR 1926 Subpart X and EM 385-1-1.

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.

1.27 FLOOR & WALL OPENINGS

A. All floor and wall openings shall comply with 29 CFR 1926 Subpart M and EM 385-1-1.

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. 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 toe boards 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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11-01-20

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:

DEPARMENT 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
AABC	Associated Air Balance Council https://www.aabc.com
AAMA	American Architectural Manufacturer's Association http://www.aamanet.org
AASHTO	American Association of State Highway and Transportation Officials http://www.aashto.org
AATCC	American Association of Textile Chemists and Colorists http://www.aatcc.org
ACGIH	American Conference of Governmental Industrial Hygienists http://www.acgih.org
ACI	American Concrete Institute http://www.aci-int.net
ACPA	American Concrete Pipe Association http://www.concrete-pipe.org
ACPPA	American Concrete Pressure Pipe Association http://www.acppa.org
ADC	Air Diffusion Council http://flexibleduct.org

AGA American Gas Association
http://www.aga.org

AGC Associated General Contractors of America
http://www.agc.org

AGMA American Gear Manufacturers Association, Inc.
http://www.agma.org

AH American Hort
https://www.americanhort.org

AHAM Association of Home Appliance Manufacturers
http://www.aham.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

AITC American Institute of Timber Construction
https://aitc-glulam.org

AMCA Air Movement and Control Association, Inc.
http://www.amca.org

ANSI American National Standards Institute, Inc.
http://www.ansi.org

APA The Engineered Wood Association
http://www.apawood.org

ARI Air-Conditioning and Refrigeration Institute
http://www.ari.org

ARPM Association for Rubber Product Manufacturers

https://arpm.com

ASABE American Society of Agricultural and Biological Engineers
https://www.asabe.org

ASCE American Society of Civil Engineers
http://www.asce.org

ASHRAE American Society of Heating, Refrigerating, and Air-Conditioning Engineers
http://www.ashrae.org

ASME American Society of Mechanical Engineers
http://www.asme.org

ASSE American Society of Sanitary Engineering International
http://www.asse-plumbing.org

ASTM American Society for Testing and Materials International
http://www.astm.org

AWI Architectural Woodwork Institute
https://www.awinet.org

AWS American Welding Society
https://www.aws.org

AWWA American Water Works Association
https://www.awwa.org

BHMA Builders Hardware Manufacturers Association
https://www.buildershardware.com

BIA The Brick Industry Association
http://www.gobrick.com

CAGI Compressed Air and Gas Institute
https://www.cagi.org

CGA Compressed Gas Association, Inc.
https://www.cganet.com

CI The Chlorine Institute, Inc.
https://www.chlorineinstitute.org

CISCA Ceilings and Interior Systems Construction Association
https://www.cisca.org

CISPI Cast Iron Soil Pipe Institute
https://www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute
https://www.chainlinkinfo.org

CPA Composite Panel Association
https://www.compositepanel.org

CPMB Concrete Plant Manufacturers Bureau
https://www.cpmb.org

CRA California Redwood Association
http://www.calredwood.org

CRSI Concrete Reinforcing Steel Institute
https://www.crsi.org

CTI Cooling Technology Institute
https://www.cti.org

DHA Decorative Hardwoods Association
https://www.decorativehardwoods.org

DHI Door and Hardware Institute
https://www.dhi.org

EGSA Electrical Generating Systems Association
http://www.egsa.org

EEI Edison Electric Institute
https://www.eei.org

EPA	United States Environmental Protection Agency https://www.epa.gov
ETL	ETL Testing Services http://www.intertek.com
FAA	Federal Aviation Administration https://www.faa.gov
FCC	Federal Communications Commission https://www.fcc.gov
FPS	Forest Products Society http://www.forestprod.org
GANA	Glass Association of North America http://www.glasswebsite.com
FM	Factory Mutual Global Insurance https://www.fmglobal.com
GA	Gypsum Association https://gypsum.org
GSA	General Services Administration https://www.gsa.gov
HI	Hydraulic Institute http://www.pumps.org
ICC	International Code Council https://shop.iccsafe.org
ICEA	Insulated Cable Engineers Association https://www.icea.net
ICAC	Institute of Clean Air Companies http://www.icac.com
IEEE	Institute of Electrical and Electronics Engineers https://www.ieee.org\

IGMA Insulating Glass Manufacturers Alliance

https://www.igmaonline.org

IMSA International Municipal Signal Association
http://www.imsasafety.org

MBMA Metal Building Manufacturers Association
https://www.mbma.com

MSS Manufacturers Standardization Society of the Valve and Fittings Industry
http://msshq.org

NAAMM National Association of Architectural Metal Manufacturers
https://www.naamm.org

PHCC Plumbing-Heating-Cooling Contractors Association
https://www.phccweb.org

NBS National Bureau of Standards
See - NIST

NBBI The National Board of Boiler and Pressure Vessel Inspectors
https://www.nationalboard.org

NEC National Electric Code
See - NFPA National Fire Protection Association

NEMA National Electrical Manufacturers Association
https://www.nema.org

NFPA National Fire Protection Association
https://www.nfpa.org

NHLA National Hardwood Lumber Association
https://www.nhla.com

NIH National Institute of Health
https://www.nih.gov

NIST National Institute of Standards and Technology
https://www.nist.gov

NELMA Northeastern Lumber Manufacturers Association, Inc.
http://www.nelma.org

NPA National Particleboard Association
(See CPA, Composite Panel Association)

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

OSHA Occupational Safety and Health Administration
Department of Labor
https://www.osha.gov

PCA Portland Cement Association
https://www.cement.org

PCI Precast Prestressed Concrete Institute
https://www.pci.org

PPI Plastics Pipe Institute
https://www.plasticpipe.org

PEI Porcelain Enamel Institute
http://www.porcelainenamel.com

PTI Post-Tensioning Institute
http://www.post-tensioning.org

RFCI Resilient Floor Covering Institute
https://www.rfci.com

RIS Redwood Inspection Service
(See Western Wood Products Association)

https://www.wwpa.org

SCMA Southern Cypress Manufacturers Association
http://www.cypressinfo.org

SDI	Steel Door Institute http://www.steeldoor.org
SJI	Steel Joist Institute https://www.steeljoist.org
SMACNA	Sheet Metal & Air-Conditioning Contractors' National Association https://www.smacna.org
SSPC	The Society for Protective Coatings https://www.sspc.org
STI	Steel Tank Institute https://www.steeltank.com
SWI	Steel Window Institute https://www.steelwindows.com
TCNA	Tile Council of North America https://www.tcnatile.com
TEMA	Tubular Exchanger Manufacturers Association http://www.tema.org
TPI	Truss Plate Institute https://www.tpinst.org
UBC	The Uniform Building Code (See ICC)
UL	Underwriters' Laboratories Incorporated https://www.ul.com
ULC	Underwriters' Laboratories of Canada https://www.ulc.ca
WCLB	West Coast Lumber Inspection Bureau http://www.wclib.org
WDMA	Window and Door Manufacturers Association

https://www.wdma.com

WRCLA Western Red Cedar Lumber Association

https://www.realcedar.com

WWPA Western Wood Products Association

http://www.wwpa.org

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02-01-21

SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies requirements for Contractor Quality Control (CQC) for Design-Bid-Build (DBB) or Design-Build (DB) construction projects. This section can be used for both project types.

1.2 APPLICABLE PUBLICATIONS

A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. ASTM International (ASTM)

1. D3740-23 Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
2. E329-23 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.3 SUBMITTALS

Government approval is required for all submittals. CQC inspection reports shall be submitted under this Specification section and follow the [Applicable CQC Control Phase (Preparatory, Initial, or Follow-Up)]: [Applicable Specification section] naming convention.

1. Preconstruction Submittals
    a. Interim CQC Plan
    b. CQC Plan
    c. Additional Requirements for Design Quality Control (DQC) Plan
2. Design Data
    a. Discipline-Specific Checklists
    b. Design Quality Control
3. Test Reports
    a. Verification Statement

PART 2 PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

Establish and maintain an effective quality control (QC) system. that complies with the FAR Clause 52.246.12 titled "Inspection of Construction". QC consists of plans, procedures, and organization necessary to produce an end product which complies with the Contract requirements. The QC system covers all design and construction operations, both onsite and offsite, and be keyed to the proposed design and construction sequence. The project superintendent will be held responsible for the quality of work and is subject to removal by the Contracting Office or Authorized designee for non-compliance with the quality requirements specified in the Contract. In this context the highest level manager responsible for the overall construction activities at the site, including quality and production is the project superintendent. The project superintendent maintains a physical presence at the site at all times and is responsible for all construction and related activities at the site, except as otherwise acceptable to the Contracting Officer.

3.2 CQC PLAN:

A. Submit the CQC Plan no later than CO or Designee to determine during Constructability review – 30 days after receipt of Notice to Proceed (NTP) proposed to implement the requirements of the FAR Clause 52.246.12 titled "Inspection of Construction". The Government will consider an Interim CQC Plan for the first to match timeline established immediately above days of operation, which must be accepted within 10 business days of NTP. Design and/or construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an Interim plan applicable to the particular feature of work to be started. Work outside of the accepted Interim CQC Plan will not be permitted to begin until acceptance of a CQC Plan or another Interim CQC Plan containing the additional work scope is accepted.

B. Content of the CQC Plan: Include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record consultants, architects/engineers (A/E), fabricators, suppliers, and purchasing agents:

1. A description of the QC organization, including a chart showing lines of authority and acknowledgement that the CQC staff will implement the three phase control system for all aspects of the work specified. Include a CQC System Manager that reports to the project superintendent.
2. The name, qualifications (in resume format) duties, responsibilities, and authorities of each person assigned a CQC function.
3. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the Contract. Letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities will be issued by the CQC System Manager. Furnish copies of these letters to the Contracting Officer or Authorized designee.
4. Procedures for scheduling, reviewing, certifying, and managing submittals including those of subcontractors, designers of record, consultants, A/E's offsite fabricators, suppliers and purchasing agents. These procedures must be in accordance with Section 01 33 23 Shop Drawings, Product Data, and Samples.
5. Control, verification, and acceptance of testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test. (Laboratory facilities approved by the Contracting Officer or Authorized designee are required to be used)

6. Procedures for tracking Preparatory, Initial, and Follow-Up control phases and control, verification, and acceptance tests including documentation.
7. Procedures for tracking design and construction deficiencies from identification through acceptable corrective action. Establish verification procedures that identified deficiencies have been corrected.
8. Reporting procedures, including proposed reporting formats.
9. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks has separate control requirements, and is identified by different trades or disciplines, or it is work by the same trade in a different environment. Although each section of specifications can generally be considered as a definable feature of work, there are frequently more than one definable feature under a particular section. This list will be agreed upon during the Coordination meeting.
10. Coordinate schedule work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections and Schedule of Special Inspections. Where the applicable Code issue by the International Code Council (ICC) calls for inspections by the Building Official, the Contractor must include the inspections in the CQC Plan and must perform the inspections required by the applicable ICC. The Contractor must perform these inspections using independent qualified inspectors. Include the Special Inspection Plan requirements in the CQC Plan.

C. Additional Requirements for Design Quality Control (DQC) Plan: The following additional requirements apply to the DQC Plan for DB projects only and not DBB projects:
   1. Submit and maintain a DQC Plan as an effective QC program which assures that all services required by this contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, all documents must be technically reviewed by competent, independent reviewers identified in the DQC Plan. The same element that produced the product may not perform the independent technical review (ITR). Correct errors and

deficiencies in the design documents prior to submitting them to the Government.

2. Include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project design tasks within the specific Contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. Include review and correction periods associated with each item. This should be a forward planning as well as a project monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, submit a revised schedule reflecting the change within 7 calendar days. Include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. Submit at each design phase as part of the project documentation these completed discipline-specific checklists.
3. Implement the DQC Plan by a DQC Manager who has the responsibility of being cognizant of and assuring that all documents on the project have been coordinated. This individual must be a person who has verifiable engineering or architectural design experience and is a Professional Engineer or Registered Architect within the state of Construction location. Notify the Contracting Officer or Authorized designee, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

D. Acceptance of Plan: Acceptance of the Contractor’s plan is required prior to the start of design and construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction. The Government reserves the right to require the Contractor to make changes in the CQC Plan and operations including removal of personnel as necessary, to obtain the quality specified.

E. Notification of Changes: After acceptance of the CQC Plan, notify the Contracting Officer or Authorized designee in writing of any proposed

change. Proposed changes are subject to acceptance by the Government prior to implementation by the Contractor.

3.3 COORDINATION MEETING:

After the Preconstruction Conference Post-award Conference before start of design or construction, and prior to acceptance by the Government of the CQC Plan, meet with the Contracting Officer or Authorized designee to discuss the Contractor's quality control system. Submit the CQC Plan a minimum of 5 business days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details must be developed, including the forms for recording the CC operations, design activities (if applicable), control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government, signed by both the Contractor and Contracting Officer or Authorized designee and will become a part of the contract file. There can be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings or address deficiencies in the CQC system or procedures which can require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION:

A. Personnel Requirements: The requirements for the CQC organization are a Safety and Health Manager, CQC System Manager, a Design Quality Manager (if applicable), and sufficient number of additional qualified personnel to ensure safety and Contract compliance. The Safety and Health Manager shall satisfy the requirements of Specification 01 35 26 Safety Requirements and reports directly to a senior project (or corporate) official independent from the CQC System Manager. The Safety and Health Manager will also serve as a member of the CQC Staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as part of the CQC organization. The Contractor's CQC staff maintains a presence at the site at all times during progress of the work and have complete authority and

responsibility to take any action necessary to ensure Contract compliance. The CQC staff will be subject to acceptance by the Contracting Officer or Authorized designee. Provide adequate office space, filing systems, and other resources as necessary to maintain an effective and fully functional CQC organization. Promptly complete and furnish all letters, material submittals, shop drawings submittals, schedules and all other project documentation to the CQC organization. The CQC organization is responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Government.

B. CQC System Manager: Identify as CQC System Manager an individual within the onsite work organization that is responsible for overall management of CQC and has the authority to act in all CQC matters for the Contractor. The CQC system Manager is required to be a graduate engineer, graduate architect, or a graduate of construction management, with a minimum of PM or SRE to determine qualifications based on project complexity at construction review years construction experience on construction similar to the scope of this Contract. This CQC System manager is on the site at all times during construction and is employed by the General Contractor. Identify in the plan an alternate to serve in the event of the CDQC System Manager’s absence. The requirements for the alternate are the same as the CQC System Manager.

C. CQC Personnel: In addition to CQC personnel specified elsewhere in the contract, provide as part of the CQC organization specialized personnel to assist in the CQC System Manager for the following areas, as applicable: electrical, mechanical, civil, structural, environmental, architectural, materials technician submittals clerk, Commissioning Agent/LEED specialist, and low voltage systems. These individuals or specified technical companies are directly employed by the General Contractor and cannot be employed by a supplier or subcontractor on this project; be responsible to the CQC System Manager; be physically present at the construction site during work on the specialized personnel’s areas of responsibility; have the necessary education or experience in accordance with the Experience Matrix listed herein.

These individuals have no other duties other than quality control. A single person can cover more than one area provided that the single person is qualified to perform QC activities in each designated and that workload allows.

EXPERIENCE MATRIX

Area	Qualifications
Civil	Graduate Civil Engineer or Construction Manager with 2 years experience in the type of work being performed on this project or technician with 5 years related experience.
Mechanical	Graduate Mechanical Engineer with 2 years experience or construction professional with 5 years of experience supervising mechanical features of work in the field with a construction company.
Electrical	Graduate Electrical Engineer with 2 years related experience or construction professional with 5 years of experience supervising electrical features of work in the field with a construction company.
Structural	Graduate Civil Engineer (with Structural Track or Focus), Structural Engineer, or Construction Manager with 2 years experience or construction professional with 5 years experience supervising structural features of work in the field with a construction company.
Architectural	Graduate Architect with 2 years experience or construction professional with 5 years of related experience.
Environmental	Graduate Environmental Engineer with 3 years experience.
Submittals	Submittal Clerk with 1 year experience.
Concrete, Pavement, and Soils	Materials Technician with 2 years experience for the appropriate area.
Testing, Adjusting, and Balancing (TAB)	Specialist must be a member of AABC or an experienced technicaion of the firm certified by the NEBB.

Area	Qualifications
Design Quality Control Manager	Registered Architect or Professional Engineer

D. Additional Requirements: In addition to the above experience and education requirements, the CQC System Manager and Alternate CQC System Manager are required to have completed the Construction Quality Management (CQM) for Construction course. If the CQC System Manager does not have a current specification, obtain the CQM for Contractors course identification within 90 days of award. This course is periodically offered by the Naval Facilities Engineering Command and the Army Corps of Engineers. Contact the Contracting Officer or Authorized designee for information on the next scheduled class.

E. Organizational Changes: Maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer or Authorized designee for acceptance.

3.5 **SUBMITTALS AND DELIVERABLES:** Submittals have to comply with the requirements in Section 01 33 23 Shop Drawings, Product Data, and Samples. The CQC organization is responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 01 91 00 General Commissioning Requirements is included in the contract, the submittals required by the section have to be coordinated with the Section 01 33 23 Shop Drawings, Product Data, and Samples to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL:

A. CQC is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control are required to be conducted by the CQC System Manager for each definable feature of the construction work as follows:

1. Preparatory Phase: This phase is performed prior to beginning work on each definable feature of work after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase includes:

a. A review of each paragraph of applicable specifications, references codes, and standards. Make available during the preparatory inspection a copy of those sections of referenced codes and standards applicable to that portion of the work to be accomplished in the field. Maintain and make available in the field for use by Government personnel until final acceptance of the work.
b. Review of the Contract drawings.
c. Check to assure that all materials and equipment have been tested, submitted, and approved.
d. Review of provisions that have been made to provide required control inspection and testing.
e. Review Special Inspections required by Section 01 45 35 Special Inspections, that Statement of Special Inspections and the Schedule of Specials Inspections.
f. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the Contract.
g. Examination of required materials, equipment, and sample work to assure that they are on hand conform to approved shop drawings or submitted data, and are properly stored.
h. Review of the appropriate Activity Hazard Analysis (AHA) to assure safety requirements are met.
i. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards – contract defined or industry standard if not contract defined - for that feature of work.
j. Check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
k. Discussion of the initial control phase.
l. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the Preparatory control phase. Include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as

applicable), and the foreman responsible for the definable feature. Document the results of the Preparatory phase actions by separate minutes prepared by the CQC System Manager and attach to the daily CQC report. Instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

B. Initial Phase: This phase is accomplished at the beginning of a definable feature of work. Accomplish the following:

1. Check work to ensure that it is in full compliance with contract requirements. Review minutes of the Preparatory meeting.
2. Verify adequacy of controls to ensure full contract compliance. Verify the required control inspection and testing is in compliance with the contract.
3. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
4. Resolve all differences.
5. Check safety to include compliance with an upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
6. The Government needs to be notified at least 48 hours or 2 business days in advance of beginning the initial phase for definable features of work. Prepare separate minutes of this phase by the CQC System Manager and attach to the daily CQC report. Indicate the exact location of initial phase for definable feature of work for future reference and comparison with Follow-Up phases.
7. The initial phase for each definable feature of work is repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.
8. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections.

C. Follow-Up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements until the completion of the particular feature of

work. Record the checks in the CQC documentation. Conduct final Follow-Up checks and correct all deficiencies prior to the start of additional features of work which may be affected by the deficient work. Do not build upon nor conceal non-conforming work. Coordinate scheduled work with Special Inspections required by Section 01 45 35 Special Inspections, the Statement of Special Inspections, and the Schedule of Special Inspections

D. Additional Preparatory and Initial Phases on the same definable features of work if: the quality ongoing work is unacceptable; if there are changes in the applicable CQC staff, onsite production supervision or work crew; if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

A. Testing Procedure: Perform specified or required tests to verify that control measures are adequate to provide a product which conforms to contract requirements. Upon request, furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and acceptance test when specified. Procure the services of a Department of Veteran Affairs approved testing laboratory or establish an approved testing laboratory at the project site. Perform the following activities and record and provide the following data:

1. Verify that testing procedures comply with contract requirements.
2. Verify that facilities and testing equipment are available and comply with testing standards.
3. Check test instrument calibration data against certified standards.
4. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
5. Record results of all tests taken, both passing and failing on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the unique sequential control number identifying the test. If approved by the Contracting Officer or Authorized designee, actual test reports are submitted later with a reference to the test number and date taken. Provide an

information copy of tests performed by an offsite or commercial test facility directly to the Contracting Officer or Authorized designee. Failure to submit timely test reports as stated results in nonpayment for related work performed and disapproval of the test facility for this Contract.

B. Testing Laboratories: All testing laboratories must be validated through the procedures contained in Specification section 01 45 29 Testing Laboratory Services.

1. Capability Check: The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt and steel is required to meet criteria detailed in ASTM D3740 and ASTM E329.
2. Capability Recheck: If the selected laboratory fails the capability check, the Contractor will be assessed a charge equal to value of recheck to reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the Contract amount due the Contractor.

C. Onsite Laboratory: The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests, and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.8 COMPLETION INSPECTION

A. Punch-Out Inspection: Conduct an inspection of the work by the CQC system Manager near the end of the work, or any increment of the work established by the specifications. Prepare and include in the CQC documentation a punch list of items which do not conform to the approved drawings and specifications. Include within the list of deficiencies the estimated date by which the deficiencies will be corrected. Make a second inspection the CQC System Manager or staff to ascertain that all deficiencies have been corrected. Once this is accomplished, notify the Government that the facility is ready for the Government Pre-Final Inspection.

B. Pre-Final Inspection: The Government will perform the Pre-Final Inspection to verify that the facility is complete and ready to be occupied. A Government Pre-Final Punch List may be developed as a result of this inspection. Ensure that all items on this list have been corrected before notifying the Government, so that a Final Acceptance Inspection with the customer can be scheduled. Correct any items noted on the Pre-Final Inspection in a timely manner. These inspections and any deficiency corrections required by this paragraph need to be accomplished within the time slated for completion of the entire work or any particular increment of the work if the project is divided into increments by separate construction completion dates.

C. Final Acceptance Inspection: The Contractor's QC Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Authorized designee is required to be in attendance at the Final Acceptance Inspection. Additional Government personnel can also be in attendance. The Final Acceptance Inspection will be formally scheduled by the Contracting Officer's or Authorized designee based upon results of the Pre-Final Inspection. Notify the Contracting Officer through the COR at least 14 days prior to the Final Acceptance Inspection and include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date schedule for the Final Acceptance Inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with FAR Clause 52.246-12 titled "Inspection of Construction".

3.9 DOCUMENTATION

A. Quality Control Activities: Maintain current records providing factual evidence that required QC activities and tests have been performed. Include in these records the work of subcontractors and suppliers on an acceptable form that includes, as a minimum, the following information:

1. The name and area of responsibility of the Contractor/Subcontractor

2. Operating plant/equipment with hours worked, idle, or down for repair.
3. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
4. Test and control activities performed with results and references to specification/drawing requirements. Identify the Control Phase (Preparatory, Initial, and/or Follow-Up). List deficiencies noted, along with corrective action.
5. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specification/drawing requirements.
6. Submittals and deliverables reviewed, with Contract reference, by whom, and action taken.
7. Offsite surveillance activities, including actions taken.
8. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
9. Instructions given/received and conflicts in plans and specifications.
10. Provide documentation of design quality control activities. For independent design reviews, provide, as a minimum, identification of the Independent Technical Reviewer (ITR) team, the ITR review comments, responses, and the record of resolution of the comments.

B. Verification Statement: Indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. Cover both conforming and deficient features and include a statement that equipment and materials incorporated in the work and workmanship comply with the Contract. Furnish the original and one copy of these records in report form to the Government daily with 1 week after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, prepare and submit on report for every 7 days of no work and on the last day of a no work period. All calendar days need to be accounted for throughout the life of the contract. The first report following a day of no work will be for that day only. Reports

need to be signed and dated by the CQC System Manager. Include copies of test reports and copies of reports prepared by all subordinate QC personnel within the CQC System Manager Report.

3.10 SAMPLE FORMS

Templates of various quality control reports can be found on the Whole Building Design Guide website at https://www.wbdg.org/FFC/NAVGRAPH/01%2045%2000.00%2020_quality_control_reports.pdf

3.11 **NOTIFICATION OF NONCOMPLIANCE:** The Contracting Officer or Authorized designee will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor should take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site will be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer can issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders will be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

--- End of Section ---

SECTION 01 45 29
TESTING LABORATORY SERVICES

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained by the General Contractor.

1.2 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

B. American Association of State Highway and Transportation Officials (AASHTO):

T27-23.....Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

T96-22.....Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

T99-22.....Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop

T104-22.....Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

T180-22.....Standard Method of Test for Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop

T191-14.....Standard Method of Test for Density of Soil In-Place by the Sand-Cone Method

T310-22.....Standard Method of Test for In-place Density and Moisture Content of Soil and Soil-aggregate by Nuclear Methods (Shallow Depth)

C. American Concrete Institute (ACI):

506.4R-19.....Guide for the Evaluation of Shotcrete

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

A370-23.....Standard Test Methods and Definitions for Mechanical Testing of Steel Products

A416/A416M-18.....Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete

C31/C31M-23.....Standard Practice for Making and Curing Concrete Test Specimens in the Field

C33/C33M-23.....Standard Specification for Concrete Aggregates

C39/C39M-23.....Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens

C109/C109M-23.....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars

C136-19.....Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

C138/C138M-24a.....Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

C140-23A.....Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units

C143/C143M-20.....Standard Test Method for Slump of Hydraulic Cement Concrete

C172/C172M-17.....Standard Practice for Sampling Freshly Mixed Concrete

C173/C173M-24.....Standard Test Method for Air Content of freshly Mixed Concrete by the Volumetric Method

C330/C330M-23.....Standard Specification for Lightweight Aggregates for Structural Concrete

C567/C567M-19.....Standard Test Method for Density Structural Lightweight Concrete

C780-23.....Standard Test Method for Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry

C1019-20.....Standard Test Method for Sampling and Testing Grout

C1064/C1064M-23.....Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete

C1077-17.....Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation

C1314-23b.....Standard Test Method for Compressive Strength of Masonry Prisms

D422-63(2007).....Standard Test Method for Particle-Size Analysis of Soils

D698-12(2021).....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort

D1140-17.....Standard Test Methods for Amount of Material in Soils Finer than No. 200 Sieve

D1143/D1143M-20e1.....Standard Test Methods for Deep Foundations Under Static Axial Compressive Load

D1188-22.....Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples

D1556-24.....Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method

D1557-12(2021).....Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft lbf/ft3 (2,700 KNm/m3))

D2166-16.....Standard Test Method for Unconfined Compressive Strength of Cohesive Soil

D2167-15.....Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method

D2216-19.....Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass

D2974-14.....Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

D3666-16.....Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D3740-23.....Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection

of Soil and Rock as used in Engineering Design and Construction

D6938-23.....Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

E94-22.....Standard Guide for Radiographic Examination

E164-19.....Standard Practice for Contact Ultrasonic Testing of Weldments

E329-23.....Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

E543-21.....Standard Specification for Agencies Performing Non-Destructive Testing

E605-19.....Standard Test Methods for Thickness and Density of Sprayed Fire Resistive Material (SFRM) Applied to Structural Members

E709-21.....Standard Guide for Magnetic Particle Examination

E1155-23.....Determining FF Floor Flatness and FL Floor Levelness Numbers

F3125/F3125M-23.....Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

E. American Welding Society (AWS):

D1.D1.1M-20.....Structural Welding Code-Steel

1.3 REQUIREMENTS:

A. Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation authority and will be required to submit a copy of the Certificate of Accreditation and Scope of Accreditation. The laboratory’s scope of accreditation must include the appropriate ASTM standards (i.e.; E329, C1077, D3666, D3740, A880, E543) listed in the technical sections of the specifications. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA. The policy applies to the specific

laboratory performing the actual testing, not just the "Corporate Office."

B. Inspection and Testing: Testing laboratory shall inspect materials and workmanship and perform tests described herein and additional tests requested by Contracting Officer's Representative. When it appears materials furnished, or work performed by Contractor fail to meet construction contract requirements, Testing Laboratory shall direct attention of Contracting Officer's Representative to such failure.

C. Written Reports: Testing laboratory shall submit test reports to Contracting Officer's Representative, Contractor, unless other arrangements are agreed to in writing by the Contracting Officer's Representative. Submit reports of tests that fail to meet construction contract requirements on colored paper.

D. Verbal Reports: Give verbal notification to Contracting Officer's Representative immediately of any irregularity.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 EARTHWORK:

3.2 FOUNDATION PILES:

3.3 FOUNDATION CAISSONS:

3.4 LANDSCAPING:

3.5 ASPHALT CONCRETE PAVING:

3.6 SITE WORK CONCRETE:

3.7 POST-TENSIONING OF CONCRETE:

3.8 CONCRETE:

A. Batch Plant Inspection and Materials Testing:

1. Perform continuous batch plant inspection until concrete quality is established to satisfaction of Contracting Officer's Representative with concurrence of Contracting Officer and perform periodic inspections thereafter as determined by Contracting Officer's Representative.
2. Periodically inspect and test batch proportioning equipment for accuracy and report deficiencies to Contracting Officer's Representative.

3. Sample and test mix ingredients as necessary to insure compliance with specifications.
4. Sample and test aggregates daily and as necessary for moisture content. Test the dry rodded weight of the coarse aggregate whenever a sieve analysis is made, and when it appears there has been a change in the aggregate.
5. Certify, in duplicate, ingredients and proportions and amounts of ingredients in concrete conform to approved trial mixes. When concrete is batched or mixed off immediate building site, certify (by signing, initialing or stamping thereon) on delivery slips (duplicate) that ingredients in truck-load mixes conform to proportions of aggregate weight, cement factor, and water-cement ratio of approved trial mixes.

B. Field Inspection and Materials Testing:
1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor’s expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 m^3 (50 cubic yards) or less of each concrete type, and at least three cylinders for any one day's pour for each concrete type. Label each cylinder with an identification number. Contracting Officer’s Representative may require additional cylinders to be molded and cured under job conditions.
4. Perform slump tests in accordance with ASTM C143. Test the first truck each day, and every time test cylinders are made. Test pumped concrete at the hopper and at the discharge end of the hose at the beginning of each day’s pumping operations to determine change in slump.

5. Determine the air content of concrete per ASTM C173. For concrete required to be air-entrained, test the first truck and every 20 m^3 (25 cubic yards) thereafter each day. For concrete not required to be air-entrained, test every 80 m^3 (100 cubic yards) at random. For pumped concrete, initially test concrete at both the hopper and the discharge end of the hose to determine change in air content.
6. If slump or air content fall outside specified limits, make another test immediately from another portion of same batch.
7. Perform unit weight tests in compliance with ASTM C138 for normal weight concrete and ASTM C567 for lightweight concrete. Test the first truck and each time cylinders are made.
8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
    a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
    b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.

14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
    a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
    b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
    a. Monitor and record amount of water added at project site.
    b. Observe minimum and maximum mixing times.
18. Measure concrete flatwork for levelness and flatness as follows:
    a. Perform Floor Tolerance Measurements F_F and F_L in accordance with ASTM E1155. Calculate the actual overall F- numbers using the inferior/superior area method.
    b. Perform all floor tolerance measurements within 48 hours after slab installation and prior to removal of shoring and formwork.
    c. Provide the Contractor and the Contracting Officer's Representative with the results of all profile tests, including a running tabulation of the overall F_F and F_L values for all slabs installed to date, within 72 hours after each slab installation.
19. Other inspections:
    a. Grouting under base plates.
    b. Grouting anchor bolts and reinforcing steel in hardened concrete.

C. Laboratory Tests of Field Samples:

1. Test compression test cylinders for strength in accordance with ASTM C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Contracting Officer's Representative. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.

2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Contracting Officer's Representative. In test report, indicate the following information:
   a. Cylinder identification number and date cast.
   b. Specific location at which test samples were taken.
   c. Type of concrete, slump, and percent air.
   d. Compressive strength of concrete in MPa (psi).
   e. Weight of lightweight structural concrete in kg/m^3 (pounds per cubic feet).
   f. Weather conditions during placing.
   g. Temperature of concrete in each test cylinder when test cylinder was molded.
   h. Maximum and minimum ambient temperature during placing.
   i. Ambient temperature when concrete sample in test cylinder was taken.
   j. Date delivered to laboratory and date tested.

3.9 REINFORCEMENT:

A. Review mill test reports furnished by Contractor.

B. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.

C. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.

D. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.10 SHOTCRETE:

3.11 PRESTRESSED CONCRETE:

3.12 ARCHITECTURAL PRECAST CONCRETE:

3.13 MASONRY:

3.14 STRUCTURAL STEEL:

A. General: Provide shop and field inspection and testing services to certify structural steel work is done in accordance with contract documents. Welding shall conform to AWS D1.1 Structural Welding Code.

B. Prefabrication Inspection:

1. Review design and shop detail drawings for size, length, type and location of all welds to be made.
2. Approve welding procedure qualifications either by pre-qualification or by witnessing qualifications tests.
3. Approve welder qualifications by certification or retesting.
4. Approve procedure for control of distortion and shrinkage stresses.
5. Approve procedures for welding in accordance with applicable sections of AWS D1.1.

C. Fabrication and Erection:

1. Weld Inspection:
   a. Inspect welding equipment for capacity, maintenance and working condition.
   b. Verify specified electrodes and handling and storage of electrodes in accordance with AWS D1.1.
   c. Inspect preparation and assembly of materials to be welded for conformance with AWS D1.1.
   d. Inspect preheating and interpass temperatures for conformance with AWS D1.1.
   e. Measure 25 percent of fillet welds.
   f. Welding Magnetic Particle Testing: Test in accordance with ASTM E709 for a minimum of:
      1) 20 percent of all shear plate fillet welds at random, final pass only.
      2) 20 percent of all continuity plate and bracing gusset plate fillet welds, at random, final pass only.
      3) 100 percent of tension member fillet welds (i.e., hanger connection plates and other similar connections) for root and final passes.
      4) 20 percent of length of built-up column member partial penetration and fillet welds at random for root and final passes.
      5) 100 percent of length of built-up girder member partial penetration and fillet welds for root and final passes.
   g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced

and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.

h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.

i. Verify that correction of rejected welds are made in accordance with AWS D1.1.

j. Testing and inspection do not relieve the Contractor of the responsibility for providing materials and fabrication procedures in compliance with the specified requirements.

2. Bolt Inspection:

a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM F3125 Bolts.

b. Slip-Critical Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in each connection in accordance with AISC Specifications for Structural Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.

c. Fully Pre-tensioned Connections: Inspect 10 percent of bolts, but not less than 2 bolts, selected at random in 25 percent of connections in accordance with AISC Specification for Structural Joints Using ASTM F3125 Bolts. Inspect all bolts in connection when one or more are rejected.

d. Bolts installed by turn-of-nut tightening may be inspected with calibrated wrench when visual inspection was not performed during tightening.

e. Snug Tight Connections: Inspect 10 percent of connections verifying that plies of connected elements have been brought into snug contact.

f. Inspect field erected assemblies; verify locations of structural steel for plumbness, level, and alignment.

D. Submit inspection reports, record of welders and their certification, and identification, and instances of noncompliance to Contracting Officer’s Representative.

3.15 STEEL DECKING:

3.16 SHEAR CONNECTOR STUDS:

3.17 SPRAYED-ON FIREPROOFING:

3.18 TYPE OF TEST:

Approximate Number of Tests Required

E. Concrete:

Making and Curing Concrete Test Cylinders (ASTM C31)	_____
Compressive Strength, Test Cylinders (ASTM C39)	_____
Concrete Slump Test (ASTM C143)	_____
Concrete Air Content Test (ASTM C173)	_____
Unit Weight, Lightweight Concrete (ASTM C567)	_____
Aggregate, Normal Weight: Gradation (ASTM C33)	_____
Deleterious Substances (ASTM C33)	_____
Soundness (ASTM C33)	_____
Abrasion (ASTM C33)	_____
Aggregate, Lightweight Gradation (ASTM C330)	_____
Deleterious Substances (ASTM C330)	_____
Unit Weight (ASTM C330)	_____
Flatness and Levelness Readings (ASTM E1155) (number of days)	_____

F. Reinforcing Steel:

Tensile Test (ASTM A370)	_____
Bend Test (ASTM A370)	_____
Mechanical Splice (ASTM A370)	_____
Welded Splice Test (ASTM A370)	_____

J. Structural Steel:

Ultrasonic Testing of Welds (ASTM E164)	_____
Magnetic Particle Testing of Welds (ASTM E709)	_____
Radiographic Testing of Welds (ASTM E94)	_____

- - - E N D - - -

SECTION 01 45 35
SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 **DESCRIPTION**

A. This guide specification will be applicable to both new buildings and existing building rehabilitations/renovations. In addition to the Special Inspection and testing specified requirements, a registered design professional must perform structural observations during construction. All observed deficiencies will be immediately reported to the Contracting Officer. The registered design professional performing these observations will be a representative of the Designer of Record (DOR) for the building being constructed.

B. Structural observations are required for the following project conditions per IBC Chapter 17:

1. Seismic Design Category D, E or F; and assigned to Risk Cat III, IV or V.
2. Seismic Design Category D, E or F; and with a height greater than 22860 mm 75 ft.
3. Seismic Design Category E, assigned to Risk Category I or II and the building is greater than two stories above grade plane.
4. Nominal design wind speed in excess of 49 m/sec 110 mph; and assigned to Risk Cat III, IV or V.
5. Nominal design wind speed in excess of 49 m/sec 110 mph; and with a height greater than 23 m 75 ft.

1.2 **APPLICABLE PUBLICATIONS**

A. The publication listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. American Society of Civil Engineers (ASCE)

1. ASCE 7 - (2022) Minimum Design Loads for Buildings and Other Structures

C. International Code Council (ICC)

2. ICC IBC - (2024) International Building Code

1.3 **GENERAL REQUIREMENTS**

A. Perform Special Inspections in accordance with the Statement of Special Inspections, Schedule of Special Inspections and Chapter 17 of ICC IBC. The Statement of Special Inspections and Schedule of Special Inspections are included as an attachment to this specification. Special Inspections are to be performed by an independent third party and are intended to ensure that the work of the prime contractor is in accordance with the Contract Documents and applicable building codes. Special inspections do not take the place of the three phases of control inspections performed by the Contractor's QC Manager or any testing and inspections required by other sections of the specifications.

B. Structural observations will be performed by the Government. The contractor must provide notification to the Contracting Officer 14 days prior to the following points of construction that structural observations need to occur:

1.4 **DEFINITIONS**

A. Continuous Special Inspections – The constant monitoring of specific tasks by a special inspector. These inspections must be carried out continuously over the duration of the particular tasks.

B. Periodic Special Inspections – Special Inspections by the special inspector who is intermittently present where the work to be inspected has been or is being performed. Specific time interval on a specific Special Inspection should be indicated on the Schedule of Special Inspections.

C. Perform – Perform these Special Inspections tasks for each welded joint or member.

D. Observe – Observe these Special Inspections items on a random daily basis. Operations need not be delayed pending these inspections.

E. Special Inspector (SI) – A qualified person retained by the contractor and approved by the Contracting Officer as having the competence necessary to inspect a particular type of construction requiring Special Inspections. The SI must be an independent third party hired directly by the Prime Contractor.

F. Associate Special Inspector (ASI) – A qualified person who assists the SI in performing Special Inspections but must perform inspection under

the direct supervision of the SI and cannot perform inspections without the SI on site.

G. Third Party – A third party inspector must not be company employee of the Contractor or any Sub-Contractor performing the work to be inspected.

H. Special Inspector of Record (SIOR) – SIOR must be an independent third party hired directly by the Prime Contractor and is required for the following project conditions:

1. Seismic Design Category D, E, or F; and assigned to Risk Category III, IV, or V.
2. Seismic Design Category D, E, or F; and with a height greater than 22860mm 75 ft.
3. Seismic Design Category E, assigned to Risk Category I or II and the building is greater than two (2) stories above grade plane.
4. Nominal design wind speed in excess o f49 m/sec 100 mph; and assigned to Risk Category III, IV, or V.
5. Nominal design wind speed in excess of 49 mm/sec 100mph; and with a height greater than 23m 75ft.
6. In addition to these conditions, the DOR is encouraged to consider using an SIOR on large magnitude or critical projects where this additional level of quality control is affordable.

I. Contracting Officer – The Government official having overall authority for administrative contracting actions. Certain contracting actions may be delegated to the Contracting Officer's Representative (COR).

J. Contractor’s Quality Control (QC) Manager – An individual retained by the prime contractor and qualified in accordance with the Section 01 45 00.00 10 QUALITY CONTROL having the overall responsibility for the contractor's QC organization.

K. Designer of Record (DOR) – A registered design professional is contracted by the Government as an A/E responsible for the overall design and review of submittal documents prepared by others. The DOR is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws in state in which the design professional works. The DOR is also referred to as the Engineer of Record (EOR) in design code documents.

L. Statement of Special Inspections (SSI) – A document developed by the DOR identifying the material, systems, components and work required to have Special Inspections and covering the following:
   1. List of the Architectural Designated Seismic Systems – these components are in or attached to a Risk Category IV or V structure and are needed for continued operation of the facility or their failure could impair the continued operation of the facility.
   2. List of the Mechanical Designated Seismic Systems
      a. For Seismic Design Category C or Risk V, list the following:
         1) Heating, ventilation, and air-conditioning (HVAC) ductwork containing hazardous materials and anchorage of such ductwork
         2) Piping systems and mechanical units containing flammable, combustible, or highly toxic materials.
      b. For Seismic Design Category D, E, or F or Risk Category V list mechanical system that meet one of the following:
         1) Life safety component required to function after an earthquake
         2) Component that contains hazardous content,
         3) All components in an essential facility needed for continued operation after an earthquake.
   3. List of the Electrical Designated Systems
      a. For Seismic Design Category C or Risk V, list the anchorage of electrical equipment used for emergency or standby power systems.
      b. For Seismic Design Category D, E or F list electrical system that meet one of the following:
         1) Life safety component required to function after an earthquake
         2) Component that contains hazardous content,
         3) All components in an essential facility needed for continued operation after an earthquake.
   4. List of elements that are part of the progressive collapse resistance system.
      a. Provide a description of the following as they apply:
         1) Elements of the tie force system consisting of internal longitudinal and transverse, vertical, and peripheral tie.

2) Elements of the alternate path system.

3) Elements having enhanced local resistance. The Statement of Special Inspections and the Schedule of Special Inspections will be included as an attachment to this specification

a) Schedule of Special Inspections – A schedule which lists each of the required Special Inspections, the extent to which each Special Inspections is to be performed, and the required frequency for each in accordance with ICC IBC Chapter 17. Template found here:


SECTION 01 45 35
Schedule of SI Temp


SECTION 01 45 35
Statement of SI Tem

b) Designated Seismic System – Those nonstructural components that require design in accordance with ASCE 7 Chapter 13 and for which the component importance factor, Ip, is greater than 1.0. This designation applies to systems that are required to be operational following the Design Earthquake for RC I - IV structures and following the MCER for RC V structures. All systems in RC V facilities designated as MC-1 in accordance with UFC 3-310-04 are considered part of the Designated Seismic Systems. Designated Seismic Systems will be identified by Owner and will have an Importance Factor Ip = 1.5

M. Submittals: Government approval is required for all submittals. CQC Special Inspection reports shall be submitted under this Specification section and follow the [Special Inspection]: [Applicable Specification section or description] naming convention. Submit the following:

1. SD-01 Preconstruction Submittals;
2. SIOR Letter of Acceptance;
3. Special Inspections Project Manual;
4. Special Inspections Agency's Written Practices
5. NDT Procedures and Equipment' Calibration Records;
6. SD-06 Test Reports;
7. Special Inspections
8. Daily Reports;

9. Special Inspections; Biweekly Reports;
10. SD-07 Certificates;
11. Fabrication Plant
12. Steel Truss Plant;
13. Wood Truss Plant;
14. AC472 Accreditation;
15. Steel Joist Institute Membership;
16. Precast Concrete Institute (PCI) Certified Plant;
17. Certificate of Compliance;
18. Special Inspector of Record Qualifications;
19. Special Inspector Qualifications;
20. Qualification Records for NDT technicians;
21. SD-11 Closeout Submittals;
22. Interim Final Report of Special Inspections;
23. Comprehensive Final Report of Special Inspections;

N. Special Inspector Qualifications: Submit qualifications for each SI, ASI, and the SIOR from the following certifying associations: Associated Air Balance Council (AABC); American Concrete Institute (ACI); Association of the Wall and Ceiling Industry (AWCI); American Welding Society (AWS); Factory Mutual (FM); International Code Council (ICC); Nondestructive Testing (NDT); National Institute for Certification in Engineering Technologies (NICET); Precast/Prestressed Concrete Institute (PCI); Post-Tensioning Institute (PTI); Underwriters Laboratories (UL). Qualifications should be in accordance with the following minimums.

QUALIFICATIONS

Area	Special Inspector	Associated Special Inspector	SIOR
Steel Construction and High Strength Bolting	ICC Structural Steel and Bolting Special Inspector certificate with on year of related experience, or Registered Professional Engineer with related experience.	Engineer-In-Training with one year of related experience.	
Welding Structural Steel (For highly complex steel use only AWS Certified Welding Inspectors)	ICC Welding Special Inspector certificate with one year of related experience or AWS Certified Welding Inspector	AWS Certified Associate Welding Inspector	
Nondestructive Testing of Welds	NDT Level II Certificate	NDT Level II Certificate plus one year of related experience	
Cold Formed Steel Framing	ICC Structural Steel and Bolting Special Inspector certificate with on year of related experience, or ICC Commercial Building Inspector with one year of experience; or Registered Professional Engineer with related experience.	Engineer-In-Training with one year of related experience.	

Area	Special Inspector	Associated Special Inspector	SIOR
Concrete Construction	ICC Reinforced Concrete Special Inspector Certificate with one year of related experience, or ACI Concrete Construction Special Inspector, or NICET Concrete Technician Level III Certificate in Construction Materials Testing, or, Registered Professional Engineer with related experience	ACI Concrete Construction Special Inspector in Training, or Engineer-In-Training with one year of related experience	
Fire-Resistant Penetrations and Joints	Passed the UL Firestop Exam with one year of related experience, or Passed the FM Firestop Exam with one year of related experience, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience.	
Smoke Control	AABC Technician Certification with one year of related experience, or Registered Professional Engineer with related experience	Engineer-In-Training with one year of related experience.	
SIOR			Registered Professional Engineer

PART 2 - PRODUCTS

2.1 FABRICATORS SPECIAL INSPECTION

A. Special Inspections of fabricator's work performed in the fabricator's shop is required to be inspected in accordance with the Statement of

Special Inspections and the Schedule of Special Inspections unless the fabricator is certified by the approved agency to perform such work without Special Inspections. Submit the applicable certification(s) from the following list to the Contracting Officer for information to allow work performed in the fabricator's shop to not be subjected to Special Inspections.

B. The following certifications meet the requirements for fabricator approval in accordance with paragraph 1704.2.5.2 of IBC:
   1. American Institute of Steel Construction (AISC) Certified Fabrication Plant, Category STD.
   2. Truss Plate Institute (TPI) steel truss plate quality assurance program certification.
   3. Truss Plate Institute (TPI) wood truss plate quality assurance program certification.
   4. International Accreditation Service, AC472 Accreditation Steel Joist Institute Membership
   5. Precast Concrete Institute (PCI) Certified Plant, Group C

C. At the completion of fabrication, submit a certificate of compliance, to be included with the comprehensive final report of Special **Inspections, stating that the materials supplied and work performed by** the fabricator are in accordance the construction documents.

PART 3 - EXECUTION

3.1 RESPONSIBILIES MATRIX

Inspector	Responsibility	Condition
SIOR	a. Supervise all Special Inspectors required by the contract documents and the IBC. b. Submit a SIOR Letter of Acceptance to the Contracting Officer attesting to acceptance of the duties of SIOR, signed and sealed by the SIOR. c. Verify the qualifications of all of the Special Inspectors. d. Verify the qualifications of fabricators.	Applicable when SIOR is required

Inspector	Responsibility	Condition
	e. Submit Special Inspections agency's written practices for the monitoring and control of the agency's operations to include the following: 1. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel. 2. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection. f. Submit qualification records for nondestructive testing (NDT) technicians designated for the project. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.	Applicable when SIOR is required and when the structural design is required to follow AISC341 for seismic design of steel structures
	g. Prepare a Special Inspections Project Manual, which will cover the following: 1. Roles and responsibilities of the following individuals during Special Inspections: SIOR, SI, General Contractor, Subcontractors, QC Manager, and DOR. 2. Organizational chart and/or communication plan, indicating lines of communication 3. Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate inspectors. Contractor's internal plan for scheduling inspections. Address items such as timeliness of inspection requests, who to contact for inspection requests, and availability of alternate inspectors. 4. Indicate the government reporting procedures. 5. Propose forms or templates to be used by SI and SIOR to document inspections. 6. Indicate procedures for tracking nonconforming work and verification that corrective work is complete. 7. Indicate how the SIOR and/or SI will participate in weekly QC meetings. 8. Indicate how Special Inspections of shop fabricated items will be handled when the	Applicable when SIOR is required

Inspector	Responsibility	Condition
	fabricator's shop is not certified per paragraph FABRICATOR SPECIAL INSPECTIONS. 9. Include a section in the manual that covers each specific item requiring Special Inspections that is indicated on the Schedule of Special Inspections. Provide names and qualifications of each special inspector who will be performing the Special Inspections for each specific item. Provide detail on how the Special Inspections are to be carried out for each item so that the expectations are clear for the General Contractor and the Subcontractor performing the work. Make a copy of the Special Inspections Project Manual available on the job site during construction. Submit a copy of the Special Inspections Project Manual for approval. h. Attend coordination and mutual understanding meeting where the information in the Special Inspections Project Manual will be reviewed to verify that all parties have a clear understanding of the Special Inspections provisions and the individual duties and responsibilities of each party. i. Maintain a 3- ring binder for the Special Inspector's daily and biweekly reports and the Special Inspections Project Manual. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the DOR. j. Submit a copy of the Special Inspector's daily reports to the QC Manager. k. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report. l. Submit a biweekly Special Inspections report until all work requiring Special Inspections is complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following: 1. A brief summary of the work performed during the reporting time frame. 2. Changes and/or discrepancies with the drawings, specifications, and mechanical or electrical component certification if they	

Inspector	Responsibility	Condition
	require seismic systems, that were observed during the reporting period. 3. Discrepancies which were resolved or corrected. 4. A list of nonconforming items requiring resolution. 5. All applicable test results including nondestructive testing reports.	
QC Manager	a. If there is no SIOR, QC Manager must Supervise all Special Inspectors required by the contract documents and the IBC; Verify the qualifications of all of the Special Inspectors; Verify the qualifications of fabricators; Maintain a 3-ring binder for the Special Inspector's daily and biweekly reports. This file must be located in a conspicuous place in the project trailer/office to allow review by the Contracting Officer and the DOR.	Applicable when SIOR is not required
	b. Maintain a rework items list that includes discrepancies noted on the Special Inspectors daily report.	n/a
Special Inspectors	a. Inspect all elements of the project for which the special inspector is qualified to inspect and are identified in the Schedule of Special Inspections. b. Attend preparatory phase meetings related to the Definable Feature of Work (DFOW) for which the special inspector is qualified to inspect.	
	c. Submit Special Inspections agency's written practices for the monitoring and control of the agency's operations to include the following: 1. The agency's procedures for the selection and administration of inspection personnel, describing the training, experience and examination requirements for qualifications and certification of inspection personnel. 2. The agency's inspection procedures, including general inspection, material controls, and visual welding inspection. d. Submit qualification records for nondestructive testing (NDT) technicians designated for the project.	Applicable when SIOR is NOT required and when the structural design is required to follow AISC 341 for seismic design of steel structures

Inspector	Responsibility	Condition
	e. Submit NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.]	
	f. Submit a copy of the daily reports to the QC Manager. g. Discrepancies that are observed during Special Inspections must be reported to the QC Manager for correction. If discrepancies are not corrected before the special inspector leaves the site the observed discrepancies must be documented in the daily report. h. Submit a biweekly Special Inspection Report until all inspections are complete. A report is required for each biweekly period in which Special Inspections activity occurs, and must include the following: 1. A brief summary of the work performed during the reporting time frame 2. Changes and/or discrepancies with the drawings, specifications, and mechanical or electrical component certification if they require seismic systems that were observed during the reporting period. 3. Discrepancies which were resolved or corrected. 4. A list of nonconforming items requiring resolution. 5. All applicable test result including nondestructive testing reports. j. At the completion of the project submit a comprehensive final report of Special Inspections that documents the Special Inspections completed for the project and corrections of all discrepancies noted in the daily reports. The comprehensive final report of Special Inspections must be signed, dated and indicate the certification of the special inspector qualifying them to conduct the inspection.	Applicable when SIOR is not required
	k. Submit daily reports to the SIOR	Applicable when SIOR is required

3.2 DEFECTIVE WORK

Check work as it progresses, but failure to detect any defective work or materials must in no way prevent later rejection if defective work or materials are discovered, nor obligate the Government to accept such work.

-- End of Section -

01-01-21

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 leaves, tree trimmings, ashes, and 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’s Representative (COR) 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 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. Environmental Monitoring Plans for the job site including land, water, air, and noise.

j. 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.

k. Inclusion of “best management practices” and methodologies.

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, topsoil, and landforms without permission from the COR. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted. Provide erosion control plans, in phases where required.
   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.

C. 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 Alabama Department of Environmental Management 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 (such as from asphaltic batch plants) at all times, including weekends, holidays, and hours when work is not in progress.
   2. Particulates Control: Maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, 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.

D. 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 COR. 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 6:00p.m unless otherwise permitted by local ordinance or the COR. 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 meter (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
		CONCRETE MIXERS	75
		CONCRETE PUMPS	75
		CRANES	75
		DERRICKS IMPACT	75
TRUCKS	75		
		PNEUMATIC TOOLS	80
PUMPS	75		
GENERATORS	75	SAWS	75

COMPRESSORS	75	VIBRATORS	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 COR noting any problems and the alternatives for mitigating actions.

E. 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.

F. 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 COR. 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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07-01-15

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:

D. Waste Management Plan development and implementation.

E. Techniques to minimize waste generation.

F. Sorting and separating of waste materials.

G. Salvage of existing materials and items for reuse or resale.

H. Recycling of materials that cannot be reused or sold.

I. At a minimum the following waste categories shall be diverted from landfills:

1. Soil.
2. Inerts (eg, concrete, masonry and asphalt).
3. Clean dimensional wood and palette wood.
4. Green waste (biodegradable landscaping materials).
5. Engineered wood products (plywood, particle board and I-joists, etc).
6. Metal products (eg, steel, wire, beverage containers, copper, etc).
7. Sheathings
8. Cardboard, paper and packaging.
9. Bitumen roofing materials.
10. Plastics (eg, ABS, PVC).
11. Carpet and/or pad.
12. Gypsum board.
13. Insulation.
14. Paint.
15. Fluorescent lamps.

1.2 RELATED WORK

A. Section 02 41 00, DEMOLITION.

B. Section 01 00 00, GENERAL REQUIREMENTS.

1. D. Division 1 Sustainability specifications

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.

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 CORa 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.
            a) The names and locations of mixed debris reuse and recycling facilities or sites.
            b) The names and locations of trash disposal landfill facilities or sites.
            c) 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.

E. Target waste diversion rate by material and an overall diversion rate.

F. Final report documenting the results of implementation of the preconstruction waste management plan.

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. Green Building Initiative (GBI): Green Globes for New Construction 2024

1.7 RECORDS

A. 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.

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

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10-01-17

SECTION 01 81 13
SUSTAINABLE CONSTRUCTION REQUIREMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This Section describes general requirements and procedures to comply with federal mandates and U.S. Department of Veterans Affairs (VA) policies for sustainable construction.

B. The Design Professional has selected materials and utilized integrated design processes that achieve the Government's objectives. Contractor is responsible to maintain and support these objectives in developing means and methods for performing work and in proposing product substitutions or changes to specified processes. Obtain approval from Contracting Officer for all changes and substitutions to materials or processes. Proposed changes must meet, or exceed, materials or processes specified.

1.2 RELATED WORK

A. Section 01 57 19 TEMPORARY ENVIRONMENTAL CONTROLS.

B. Section 01 74 19 CONSTRUCTION WASTE MANANGEMENT.

1.3 DEFINITIONS

A. Recycled Content: Recycled content of materials is defined according to Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260). Recycled content value of a material assembly is determined by weight. Recycled fraction of assembly is multiplied by cost of assembly to determine recycled content value.

1. "Post-Consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-Consumer" material is defined as material diverted from waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

B. Biobased Products: Biobased products are derived from plants and other renewable agricultural, marine, and forestry materials and provide an

alternative to conventional petroleum derived products. Biobased products include diverse categories such as lubricants, cleaning products, inks, fertilizers, and bioplastics.

C. Low Pollutant-Emitting Materials: Materials and products which are minimally odorous, irritating, or harmful to comfort and well-being of installers and occupants.

D. Volatile Organic Compounds (VOC): Chemicals that are emitted as gases from certain solids or liquids. VOCs include a variety of chemicals, some of which may have short- and long-term adverse health effects.

1.4 REFERENCE STANDARDS

A. Carpet and Rug Institute Green Label Plus program.

B. U.S. Department of Agriculture BioPreferred program (USDA BioPreferred).

C. U.S. Environmental Protection Agency Comprehensive Procurement Guidelines (CPG).

D. U.S. Environmental Protection Agency WaterSense Program (WaterSense).

E. U.S. Environmental Protection Agency ENERGY STAR Program (ENERGY STAR).

F. U. S. Department of Energy Federal Energy Management Program (FEMP).

G. Green Electronic Council EPEAT Program (EPEAT).

1.5 SUBMITTALS

A. All submittals to be provided by contractor to COR.

B. Sustainability Action Plan:

1. Submit documentation as required by this section; provide additional copies of typical submittals required under technical sections when sustainable construction requires copies of record submittals.
2. Within 30 days after Preconstruction Meeting provide a narrative plan for complying with requirements stipulated within this section.
3. Sustainability Action Plan must:
   a. Make reference to sustainable construction submittals defined by this section.
   b. Address all items listed under PERFORMANCE CRITERIA.
   c. Indicate individual(s) responsible for implementing the plan.

C. Low Pollutant-Emitting Materials Tracking Spreadsheet: Within 30 days after Preconstruction Meeting provide a preliminary Low Pollutant-Emitting Materials Tracking Spreadsheet. The Low Pollutant-Emitting

Materials Tracking Spreadsheet must be an electronic file and include all materials on Project in categories described under Low Pollutant-Emitting Materials in 01 81 13.

D. Construction Indoor Air Quality (IAQ) Management Plan:
   1. Not more than 30 days after Preconstruction Meeting provide a Construction IAQ Management Plan as an electronic file including descriptions of the following:
      a. Instruction procedures for meeting or exceeding minimum requirements of ANSI/SMACNA 008-2008, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling.
      b. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage.
      c. Schedule of submission of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials.
      d. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille.
      e. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit.
      f. Instruction procedures and schedule for implementing building flush-out.

E. Product Submittals:
   1. Recycled Content: Submit product data from manufacturer indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content (excluding MEP systems equipment and components).
   2. Biobased Content: Submit product data for products to be installed or used which are included in any of the USDA BioPreferred program’s product categories. Data to include percentage of biobased content and source of biobased material.
   3. Low Pollutant-Emitting Materials: Submit product data confirming compliance with relevant requirements for all materials on Project

in categories described under Low Pollutant-Emitting Materials in 01 81 13.

4. For applicable products and equipment, submit product documentation confirming ENERGY STAR label, FEMP certification, WaterSense, and/or EPEAT certification.

F. Sustainable Construction Progress Reports: Concurrent with each Application for Payment, submit a Sustainable Construction Progress Report to confirm adherence with Sustainability Action Plan.

1. Include narratives of revised strategies for bringing work progress into compliance with plan and product submittal data.
2. Include updated and current Low Pollutant-Emitting Materials Tracking Spreadsheet.
3. Include construction waste tracking, in tons or cubic yards, including waste description, whether diverted or landfilled, hauler, and percent diverted for comingled quantities; and excluding land-clearing debris and soil. Provide haul receipts and documentation of diverted percentages for comingled wastes.

G. Closeout Submittals: Within 14 days after Substantial Completion provide the following:

1. Final version of Low Pollutant-Emitting Materials Tracking Spreadsheet.
2. Manufacturer’s cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed air handling units are used during construction.
3. Manufacturer’s cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for final filtration media in air handling units.
4. Minimum 18 construction photographs including six photographs taken on three different occasions during construction of ANSI/SMACNA 008-2008, Chapter 3 approaches employed, along with a brief description of each approach, documenting implementation of IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
5. Flush-out Documentation:

a. Product data for filtration media used during flush-out.

b. Product data for filtration media installed immediately prior to occupancy.

c. Signed statement describing building air flush-out procedures including dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

1.6 QUALITY ASSURANCE

A. Preconstruction Meeting: After award of Contract and prior to commencement of Work, schedule and conduct meeting with Contracting Officer's Representative and Architect to discuss the Project Sustainable Action Plan content as it applies to submittals, project delivery, required Construction Indoor Air Quality (IAQ) Management Plan, and other Sustainable Construction Requirements. The purpose of this meeting is to develop a mutual understanding of the Sustainable Construction Requirements and coordination of contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.

B. Construction Job Conferences: Status of compliance with Sustainable Construction Requirements of these specifications will be an agenda item at regular job meetings conducted during the course of work at the site.

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. Green Seal Standard GS-11, Paints, 4th Edition, September 7, 2021.

C. Green Seal Standard GC-03, Anti-Corrosive Paints, 2nd Edition, January 7, 1997.

D. Green Seal Standard GC-36, Commercial Adhesives, 2.1 Edition May 20, 2023.

E. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules in effect on 2020.

F. South Coast Air Quality Management District (SCAQMD) Rule 1168, October 2017.

G. Sheet Metal and Air Conditioning National Contractors' Association (SMACNA) IAQ Guidelines for Occupied Buildings under Construction, 2nd Edition (ANSI/SMACNA 008-2008), Chapter 3.

H. California Department of Public Health Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers, Version 1.1, Emission Testing method for California Specification 01350 (CDPH Standard Method V1.2-2017).

I. Federal Trade Commission Guides for the Use of Environmental Marketing Claims (16 CFR Part 260).

J. ASHRAE Standard 52.2-2017.

PART 2 – PRODUCTS

2.1 PERFORMANCE CRITERIA

A. Construction waste diversion from landfill disposal must comprise at least 50 percent of total construction waste, excluding land clearing debris and soil. Alternative daily cover (ADC) does not qualify as material diverted from disposal.

B. Low Pollutant-Emitting Materials:

1. Adhesives, sealants and sealant primers applied on site within the weatherproofing membrane must comply with VOC limits of SCAQMD Rule 1168:

a. Flooring Adhesives and Sealants:

1) Indoor carpet adhesives: 50 g/L.
2) Wood Flooring Adhesive: 100 g/L.
3) Rubber Floor Adhesives: 60 g/L.
4) Subfloor Adhesives: 50 g/L.
5) Ceramic Tile Adhesives and Grout: 65 g/L.
6) Cove Base Adhesives: 50 g/L.
7) Multipurpose Construction Adhesives: 70 g/L.
8) Porous Material (Except Wood) Substrate: 50 g/L.
9) Wood Substrate: 30 g/L.
10) Architectural Non-Porous Sealant Primer: 250 g/L.
11) Architectural Porous Sealant Primer: 775 g/L.
12) Other Sealant Primer: 750 g/L.
13) Structural Wood Member Adhesive: 140 g/L.

14) Sheet-Applied Rubber Lining Operations: 850 g/L.

15) Top and Trim Adhesive: 250 g/L.

16) Architectural Sealant: 250 g/L.

17) Other Sealant: 420 g/L.

b. Non-Flooring Adhesives and Sealants:

1) Drywall and Panel Adhesives: 50 g/L.

2) Multipurpose Construction Adhesives: 70 g/L.

3) Structural Glazing Adhesives: 100 g/L.

4) Metal-to-Metal Substrate Adhesives: 30 g/L.

5) Plastic Foam Substrate Adhesive: 50 g/L.

6) Porous Material (Except Wood) Substrate Adhesive: 50 g/L.

7) Wood Substrate Adhesive: 30 g/L.

8) Fiberglass Substrate Adhesive: 80 g/L.

9) Architectural Non-Porous Sealant Primer: 250 g/L.

10) Architectural Porous Sealant Primer: 775 g/L.

11) Other Sealant Primer: 750 g/L.

12) PVC Welding Adhesives: 510 g/L.

13) CPVC Welding Adhesives: 490 g/L.

14) ABS Welding Adhesives: 325 g/L.

15) Plastic Cement Welding Adhesives: 250 g/L.

16) Adhesive Primer for Plastic: 550 g/L.

17) Contact Adhesive: 80 g/L.

18) Special Purpose Contact Adhesive: 250 g/L.

19) Structural Wood Member Adhesive: 140 g/L.

20) Sheet Applied Rubber Lining Operations: 850 g/L.

21) Top and Trim Adhesive: 250 g/L.

22) Architectural Sealants: 250 g/L.

23) Other Sealants: 420 g/L.

2. Aerosol adhesives applied on site within the weatherproofing membrane must comply with the following Green Seal GS-36.

a. Aerosol Adhesive, General-Purpose Mist Spray: 65 percent VOCs by weight.

b. Aerosol Adhesive, General-Purpose Web Spray: 55 percent VOCs by weight.

c. Special-Purpose Aerosol Adhesive (All Types): 70 percent VOCs by weight.

3. Paints and coatings applied on site within the weatherproofing membrane must comply with the following criteria:
   a. VOC content limits for paints and coatings established in Green Seal Standard GS-11.
   b. VOC content limit for anti-corrosive and anti-rust paints applied to interior ferrous metal substrates of 250 g/L established in Green Seal GC-03.
   c. Clear wood finishes, floor coatings, stains, primers, sealers, and shellacs applied to interior elements must not exceed VOC content limits established in SCAQMD Rule 1113.
   d. Comply with the following VOC content limits:
      1) Anti-Corrosive/Antirust Paints: 250 g/L.
      2) Clear Wood Finish, Lacquer: 550 g/L.
      3) Clear Wood Finish, Sanding Sealer: 350 g/L.
      4) Clear Wood Finish, Varnish: 350 g/L.
      5) Floor Coating: 100 g/L.
      6) Interior Flat Paint, Coating or Primer: 50 g/L.
      7) Interior Non-Flat Paint, Coating or Primer: 150 g/L.
      8) Sealers and Undercoaters: 200 g/L.
      9) Shellac, Clear: 730 g/L.
      10) Shellac, Pigmented: 550 g/L.
      11) Stain: 250 g/L.
      12) Clear Brushing Lacquer: 680 g/L.
      13) Concrete Curing Compounds: 350 g/L.
      14) Japans/Faux Finishing Coatings: 350 g/L.
      15) Magnesite Cement Coatings: 450 g/L.
      16) Pigmented Lacquer: 550 g/L.
      17) Waterproofing Sealers: 250 g/L.
      18) Wood Preservatives: 350 g/L.
      19) Low-Solids Coatings: 120 g/L.
4. Carpet installed in building interior must comply with one of the following:
   a. Meet testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
   b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at the 14 day time point.

5. Each non-carpet flooring element installed in building interior which is not inherently non-emitting (stone, ceramic, powder-coated metals, plated or anodized metal, glass, concrete, clay brick, and unfinished or untreated solid wood flooring) must comply with one of the following:
   a. Meet requirements of the FloorScore standard as shown with testing by an independent third-party.
   b. Maximum VOC concentrations specified in CDPH Standard Method V1.1-2010, using office scenario at 14 day time point.
6. Composite wood and agrifiber products used within the weatherproofing membrane must contain no added urea-formaldehyde resins.
7. Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifiber assemblies must not contain added urea-formaldehyde.

C. Recycled Content:
1. Any products being installed or used that are listed on EPA Comprehensive Procurement Guidelines designated product list must meet or exceed the EPA's recycled content recommendations. The EPA Comprehensive Procurement Guidelines categories include:
   a. Building insulation.
   b. Cement and concrete.
   c. Consolidated and reprocessed latex paint.
   d. Floor tiles.
   e. Flowable fill.
   f. Laminated paperboard.
   g. Modular threshold ramps.
   h. Nonpressure pipe.
   i. Patio blocks.
   j. Railroad grade crossing surfaces.
   k. Roofing materials.
   l. Shower and restroom dividers/partitions.
   m. Structural fiberboard.
   n. Nylon carpet and nylon carpet backing.
   o. Compost and fertilizer made from recovered organic materials.
   p. Hydraulic mulch.

q. Lawn and garden edging.

r. Plastic lumber landscaping timbers and posts.

s. Park benches and picnic tables.

t. Plastic fencing.

u. Playground equipment.

v. Playground surfaces.

w. Bike racks.

D. Biobased Content:

1. Materials and equipment being installed or used that are listed on the USDA BioPreferred program product category list must meet or exceed USDA's minimum biobased content threshold. Refer to individual specification sections for detailed requirements applicable to that section.

a. USDA BioPreferred program categories include:

1) Adhesive and Mastic Removers.

2) Carpets.

3) Cleaners.

4) Composite Panels.

5) Corrosion Preventatives.

6) Erosion Control Materials.

7) Dust Suppressants.

8) Fertilizers.

9) Floor Cleaners and Protectors.

10) Floor Coverings (Non-Carpet).

11) Glass Cleaners.

12) Hydraulic Fluids.

13) Industrial Cleaners.

14) Interior Paints and Coatings.

15) Mulch and Compost Materials.

16) Multipurpose Cleaners.

17) Multipurpose Lubricants.

18) Packaging Films.

19) Paint Removers.

20) Plastic Insulating Foam.

21) Pneumatic Equipment Lubricants.

22) Roof Coatings.

23) Wastewater Systems Coatings.

24) Water Tank Coatings.

25) Wood and Concrete Sealers.

26) Wood and Concrete Stains.

E. Materials, products, and equipment being installed which fall into a category covered by the WaterSense program must be WaterSense-labeled or meet or exceed WaterSense program performance requirements, unless disallowed for infection control reasons.

1. WaterSense categories include:

a. Bathroom Faucets

b. Commercial Toilets

c. Irrigation Controllers

d. Pre-Rinse Spray Valves

e. Residential Toilets

f. Showerheads

g. Spray Sprinkler Bodies

h. Urinals

F. Materials, products, and equipment being installed which fall into any of the following product categories must be Energy Star-labeled.

1. Applicable Energy Star product categories as of 09/14/2017 include:

a. Appliances:

1) Air Purifiers and Cleaners.

2) Clothes Dryers (Residential).

3) Clothes Washers (Commercial & Residential).

4) Dehumidifiers.

5) Dishwashers (Residential).

6) Freezers (Residential).

7) Refrigerators (Residential).

b. Electronics and Information Technology:

1) Audio/Video Equipment.

2) Computers.

3) Data Center Storage.

4) Digital Media Player.

5) Enterprise Servers.

6) Imaging Equipment.

7) Monitors.

8) Professional Displays.
9) Set-Top and Cable Boxes.
10) Telephones.
11) Televisions.
12) Uninterruptible Power Supplies.
13) Voice over Internet Protocol (VoIP) Phones.

c. Food Service Equipment (Commercial):
1) Dishwashers.
2) Fryers.
3) Griddles.
4) Hot Food Holding Cabinets.
5) Ice Makers.
6) Ovens.
7) Refrigerators and Freezers.
8) Steam Cookers.
9) Vending Machines.

d. Heating and Cooling Equipment:
1) Air-Source Heat Pumps (Residential).
2) Boilers.
3) Ceiling Fans (Residential).
4) Central Air Conditioners (Residential).
5) Ductless Heating and Cooling (Residential).
6) Furnaces (Residential).
7) Water Heaters.
8) Geothermal Heat Pumps (Residential).
9) Light Commercial Heating and Cooling Equipment.
10) Room Air Conditioners (Residential).
11) Ventilation Fans (Residential).

e. Other:
1) Decorative Light Strings.
2) Electric Vehicle Supply Equipment.
3) Laboratory-Grade Refrigerators and Freezers.
4) Light Bulbs.
5) Light Fixtures.
6) Pool Pumps.
7) Roof Products.

8) Water Coolers.

9) Windows, Doors, and Skylights.

G. Materials, products, and equipment being installed which fall into any of the following categories must be FEMP-designated. FEMP-designated product categories as of 09/14/2017 include:

1. Boilers (Commercial).
2. Dishwashers (Commercial).
3. Electric Chillers, Air-Cooled (Commercial).
4. Electric Chillers, Water-Cooled (Commercial).
5. Exterior Lighting.
6. Fluorescent Ballasts.
7. Fluorescent Lamps, General Service.
8. Ice Machines, Water-Cooled.
9. Industrial Lighting (High/Low Bay).
10. Light Emitting Diode (LED) Luminaires.

H. Electronic products and equipment being installed which fall into any of the following categories shall be EPEAT registered. Electronic products and equipment covered by EPEAT program as of 09/14/2017 include:

1. Computers.
2. Displays.
3. Imaging Equipment.
4. Televisions.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

A. Construction Indoor Air Quality Management:

1. During construction, meet or exceed recommended control measures of ANSI/SMACNA 008-2008, Chapter 3.
2. Protect stored on-site and installed absorptive materials from moisture damage.
3. If permanently installed air handlers are used during construction, filtration media with a minimum efficiency reporting value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE Standard 52.2-1999 (with errata but without addenda). Replace all filtration media immediately prior to occupancy.

4. Perform building flush-out as follows:
   a. After construction ends, prior to occupancy and with interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 degrees Fahrenheit and a relative humidity no higher than 60 percent. OR
   b. If occupancy is desired prior to flush-out completion, the space may be occupied following delivery of a minimum of 3500 cu. ft. of outdoor air per sq. ft. of floor area to the space. Once a space is occupied, it must be ventilated at a minimum rate of 0.30 cfm per sq. ft. of outside air or design minimum outside air rate determined until a total of 14000 cu. ft./sq. ft. of outside air has been delivered to the space. During each day of flush-out period, ventilation must begin a minimum of three hours prior to occupancy and continue during occupancy.
5. Provide construction dust control to comply with SCAQMD Rule 403.

-----END----

ENGINEER
SECTION 01 91 00
GENERAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 COMMISSIONING DESCRIPTION

A. This Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS shall form the basis of the construction phase commissioning process and procedures. The Commissioning Agent shall add, modify, and refine the commissioning procedures, as approved by the Department of Veterans Affairs (VA), to suit field conditions and actual manufacturer's equipment, incorporate test data and procedure results, and provide detailed scheduling for all commissioning tasks.

B. Various sections of the project specifications require equipment startup, testing, and adjusting services. Requirements for startup, testing, and adjusting services specified in the Division 7, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of these specifications are intended to be provided in coordination with the commissioning services and are not intended to duplicate services. The Contractor shall coordinate the work required by individual specification sections with the commissioning services requirements specified herein.

C. Where individual testing, adjusting, or related services are required in the project specifications and not specifically required by this commissioning requirements specification, the specified services shall be provided and copies of documentation, as required by those specifications shall be submitted to the VA and the Commissioning Agent to be indexed for future reference.

D. Where training or educational services for VA are required and specified in other sections of the specifications, including but not limited to Division 7, Division 8, Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 series sections of the specification, these services are intended to be provided in addition to the training and educational services specified herein.

E. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the VA's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training. Commissioning during the construction and post-occupancy phases is intended to achieve the following specific objectives according to the contract documents:
   1. Verify that the applicable equipment and systems are installed in accordance with the contact documents and according to the manufacturer's recommendations.
   2. Verify and document proper integrated performance of equipment and systems.
   3. Verify that Operations & Maintenance documentation is complete.
   4. Verify that all components requiring servicing can be accessed, serviced and removed without disturbing nearby components including ducts, piping, cabling or wiring.
   5. Verify that the VA's operating personnel are adequately trained to enable them to operate, monitor, adjust, maintain, and repair building systems in an effective and energy-efficient manner.
   6. Document the successful achievement of the commissioning objectives listed above.

F. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.

1.2 CONTRACTUAL RELATIONSHIPS

A. For this construction project, the Department of Veterans Affairs contracts with a Contractor to provide construction services. The contracts are administered by the VA Contracting Officer and the COR as the designated representative of the Contracting Officer. On this project, the authority to modify the contract in any way is strictly limited to the authority of the Contracting Officer.

B. In this project, only two contract parties are recognized and communications on contractual issues are strictly limited to VA COR and the Contractor. It is the practice of the VA to require that

communications between other parties to the contracts (Subcontractors and Vendors) be conducted through the COR and Contractor. It is also the practice of the VA that communications between other parties of the project (Commissioning Agent and Architect/Engineer) be conducted through the COR.

C. Whole Building Commissioning is a process that relies upon frequent and direct communications, as well as collaboration between all parties to the construction process. By its nature, a high level of communication and cooperation between the Commissioning Agent and all other parties (Architects, Engineers, Subcontractors, Vendors, third party testing agencies, etc.) is essential to the success of the Commissioning effort.

D. With these fundamental practices in mind, the commissioning process described herein has been developed to recognize that, in the execution of the Commissioning Process, the Commissioning Agent must develop effective methods to communicate with every member of the construction team involved in delivering commissioned systems while simultaneously respecting the exclusive contract authority of the Contracting Officer and COR. Thus, the procedures outlined in this specification must be executed within the following limitations:

1. No communications (verbal or written) from the Commissioning Agent shall be deemed to constitute direction that modifies the terms of any contract between the Department of Veterans Affairs and the Contractor.
2. Commissioning Issues identified by the Commissioning Agent will be delivered to the COR and copied to the designated Commissioning Representatives for the Contractor and subcontractors on the Commissioning Team for information only in order to expedite the communication process. These issues must be understood as the professional opinion of the Commissioning Agent and as suggestions for resolution.
3. In the event that any Commissioning Issues and suggested resolutions are deemed by the COR to require either an official interpretation of the construction documents or require a modification of the

contract documents, the Contracting Officer or COR will issue an official directive to this effect.

4. All parties to the Commissioning Process shall be individually responsible for alerting the COR of any issues that they deem to constitute a potential contract change prior to acting on these issues.
5. Authority for resolution or modification of design and construction issues rests solely with the Contracting Officer or COR, with appropriate technical guidance from the Architect/Engineer and/or Commissioning Agent.

1.3 RELATED WORK

A. Section 01 00 00 GENERAL REQUIREMENTS.
B. Section 01 32 16.01 ARCHITECTURAL AND ENGINEERING CPM SCHEDULES
C. Section 01 32.16.15 PROJECT SCHEDULES (SMALL PROJECTS – DESIGN/BID/BUILD)
D. Section 01 32.16.16 NETWORK ANALYSIS SCHEDULES (DESIGN-BUILD ONLY)
E. Section 01 32.16.17 NETWORK ANALYSIS SCHEDULES-MAJOR DESIGN/BUILD PROJECTS
F. Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
G. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS
H. Section 07 08 00 FACILITY EXTERIOR CLOSURE COMMISSIONING.
I. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
J. Section 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
K. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
L. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
M. Section 27 08 00 COMMISSIONING OF COMMUNICATIONS SYSTEMS.
N. Section 28 08 00 COMMISSIONING OF ELECTRONIC SAFETY AND SECURITY SYSTEMS.

1.4 SUMMARY

A. This Section includes general requirements that apply to implementation of commissioning without regard to systems, subsystems, and equipment being commissioned.
B. The commissioning activities have been developed to support the VA requirements to meet guidelines for Federal Leadership in Environmental, Energy, and Economic Performance.

C. The commissioning activities have been developed to support the United States Green Building Council's (USGBC) LEED ™ rating program and to support delivery of project performance in accordance with the VA requirements developed for the project to support the following credits:
   1. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" and the prerequisite of "Fundamental Building Systems Commissioning."
   2. Commissioning activities and documentation for the LEED™ section on "Energy and Atmosphere" requirements for the "Enhanced Building System Commissioning" credit.
   3. Activities and documentation for the LEED™ section on "Measurement and Verification" requirements for the Measurement and Verification credit.

D. The commissioning activities have been developed to support the Green Buildings Initiative's Green Globes rating program and to support delivery of project performance in accordance with the VA requirements developed for the project.

1.5 ACRONYMS

List of Acronyms	
Acronym	Meaning
A/E	Architect / Engineer Design Team
AHJ	Authority Having Jurisdiction
ASHRAE	Association Society for Heating Air Condition and Refrigeration Engineers
BOD	Basis of Design
BSC	Building Systems Commissioning
CCTV	Closed Circuit Television
CD	Construction Documents
CMMS	Computerized Maintenance Management System
CO	Contracting Officer (VA)
COR	Contracting Officer's Representative (see also VA-RE)
COBie	Construction Operations Building Information Exchange
CPC	Construction Phase Commissioning

List of Acronyms	
Acronym	Meaning
Cx	Commissioning
CxA	Commissioning Agent
CxM	Commissioning Manager
CxR	Commissioning Representative
DPC	Design Phase Commissioning
FPT	Functional Performance Test
GBI-GG	Green Building Initiative - Green Globes
HVAC	Heating, Ventilation, and Air Conditioning
LEED	Leadership in Energy and Environmental Design
NC	Department of Veterans Affairs National Cemetery
NCA	Department of Veterans Affairs National Cemetery Administration
NEBB	National Environmental Balancing Bureau
O&M	Operations & Maintenance
OPR	Owner's Project Requirements
PFC	Pre-Functional Checklist
PFT	Pre-Functional Test
SD	Schematic Design
SO	Site Observation
TAB	Test Adjust and Balance
VA	Department of Veterans Affairs
VAMC	VA Medical Center
VA CFM	VA Office of Construction and Facilities Management
VACO	VA Central Office
VA PM	VA Project Manager
VA-RE	VA Resident Engineer
USGBC	United States Green Building Council

1.6 DEFINITIONS

Acceptance Phase Commissioning: Commissioning tasks executed after most construction has been completed, most Site Observations and Static Tests have been completed and Pre-Functional Testing has been completed

and accepted. The main commissioning activities performed during this phase are verification that the installed systems are functional by conducting Systems Functional Performance tests and Owner Training.

Accuracy: The capability of an instrument to indicate the true value of a measured quantity.

Back Check: A back check is a verification that an agreed upon solution to a design comment has been adequately addressed in a subsequent design review

Basis of Design (BOD): The Engineer's Basis of Design is comprised of two components: the Design Criteria and the Design Narrative, these documents record the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements (OPR) and to satisfy applicable regulatory requirements, standards, and guidelines.

Benchmarks: Benchmarks are the comparison of a building's energy usage to other similar buildings and to the building itself.. For example, ENERGY STAR Portfolio Manager is a frequently used and nationally recognized building energy benchmarking tool.

Building Information Modeling (BIM): Building Information Modeling is a parametric database which allows a building to be designed and constructed virtually in 3D, and provides reports both in 2D views and as schedules. This electronic information can be extracted and reused for pre-populating facility management CMMS systems. Building Systems Commissioning (BSC): NEBB acronym used to designate its commissioning program.

Calibrate: The act of comparing an instrument of unknown accuracy with a standard of known accuracy to detect, correlate, report, or eliminate by adjustment any variation in the accuracy of the tested instrument.

CCTV: Closed circuit Television. Normally used for security surveillance and alarm detections as part of a special electrical security system.

COBie: Construction Operations Building Information Exchange (COBie) is an electronic industry data format used to transfer information developed during design, construction, and commissioning into the Computer Maintenance Management Systems (CMMS) used to operate

facilities. See the Whole Building Design Guide website for further information (http://www.wbdg.org/resources/cobie.php)

Commissionability: Defines a design component or construction process that has the necessary elements that will allow a system or component to be effectively measured, tested, operated and commissioned

Commissioning Agent (CxA): The qualified Commissioning Professional who administers the Cx process by managing the Cx team and overseeing the Commissioning Process. Where CxA is used in this specification it means the Commissioning Agent, members of his staff or appointed members of the commissioning team. Note that LEED uses the term Commissioning Authority in lieu of Commissioning Agent.

Commissioning Checklists: Lists of data or inspections to be verified to ensure proper system or component installation, operation, and function. Verification checklists are developed and used during all phases of the commissioning process to verify that the Owner's Project Requirements (OPR) is being achieved.

Commissioning Design Review: The commissioning design review is a collaborative review of the design professionals design documents for items pertaining to the following: owner's project requirements; basis of design; operability and maintainability (O&M) including documentation; functionality; training; energy efficiency, control systems' sequence of operations including building automation system features; commissioning specifications and the ability to functionally test the systems.

Commissioning Issue: A condition identified by the Commissioning Agent or other member of the Commissioning Team that adversely affects the commissionability, operability, maintainability, or functionality of a system, equipment, or component. A condition that is in conflict with the Contract Documents and/or performance requirements of the installed systems and components. (See also – Commissioning Observation).

Commissioning Manager (CxM): A qualified individual appointed by the Contractor to manage the commissioning process on behalf of the Contractor.

Commissioning Observation: An issue identified by the Commissioning Agent or other member of the Commissioning Team that does not conform

to the project OPR, contract documents or standard industry best practices. (See also Commissioning Issue)

Commissioning Plan: A document that outlines the commissioning process, commissioning scope and defines responsibilities, processes, schedules, and the documentation requirements of the Commissioning Process.

Commissioning Process: A quality focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that the facility and all of its systems, components, and assemblies are planned, designed, installed, tested, can be operated, and maintained to meet the Owner's Project Requirements.

Commissioning Report: The final commissioning document which presents the commissioning process results for the project. Cx reports include an executive summary, the commissioning plan, issue log, correspondence, and all appropriate check sheets and test forms.

Commissioning Representative (CxR): An individual appointed by a sub-contractor to manage the commissioning process on behalf of the sub-contractor.

Commissioning Specifications: The contract documents that detail the objective, scope and implementation of the commissioning process as developed in the Commissioning Plan.

Commissioning Team: Individual team members whose coordinated actions are responsible for implementing the Commissioning Process.

Construction Phase Commissioning: All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Contract Documents (CD): Contract documents include design and construction contracts, price agreements and procedure agreements. Contract Documents also include all final and complete drawings, specifications and all applicable contract modifications or supplements.

Construction Phase Commissioning (CPC): All commissioning efforts executed during the construction process after the design phase and prior to the Acceptance Phase Commissioning.

Coordination Drawings: Drawings showing the work of all trades that are used to illustrate that equipment can be installed in the space

allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances. On mechanical projects, coordination drawings include structural steel, ductwork, major piping and electrical conduit and show the elevations and locations of the above components.

Data Logging: The monitoring and recording of temperature, flow, current, status, pressure, etc. of equipment using stand-alone data recorders.

Deferred System Test: Tests that cannot be completed at the end of the acceptance phase due to ambient conditions, schedule issues or other conditions preventing testing during the normal acceptance testing period.

Deficiency: See "Commissioning Issue".

Design Criteria: A listing of the VA Design Criteria outlining the project design requirements, including its source. These are used during the design process to show the design elements meet the OPR.

Design Intent: The overall term that includes the OPR and the BOD. It is a detailed explanation of the ideas, concepts, and criteria that are defined by the owner to be important. The design intent documents are utilized to provide a written record of these ideas, concepts and criteria.

Design Narrative: A written description of the proposed design solutions that satisfy the requirements of the OPR.

Design Phase Commissioning (DPC): All commissioning tasks executed during the design phase of the project.

Environmental Systems: Systems that use a combination of mechanical equipment, airflow, water flow and electrical energy to provide heating, ventilating, air conditioning, humidification, and dehumidification for the purpose of human comfort or process control of temperature and humidity.

Executive Summary: A section of the Commissioning report that reviews the general outcome of the project. It also includes any unresolved issues, recommendations for the resolution of unresolved issues and all deferred testing requirements.

Functionality: This defines a design component or construction process which will allow a system or component to operate or be constructed in a manner that will produce the required outcome of the OPR.

Functional Test Procedure (FTP): A written protocol that defines methods, steps, personnel, and acceptance criteria for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Industry Accepted Best Practice: A design component or construction process that has achieved industry consensus for quality performance and functionality. Refer to the current edition of the NEBB Design Phase Commissioning Handbook for examples.

Installation Verification: Observations or inspections that confirm the system or component has been installed in accordance with the contract documents and to industry accepted best practices.

Integrated System Testing: Integrated Systems Testing procedures entail testing of multiple integrated systems performance to verify proper functional interface between systems. Typical Integrated Systems Testing includes verifying that building systems respond properly to loss of utility, transfer to emergency power sources, re-transfer from emergency power source to normal utility source; interface between HVAC controls and Fire Alarm systems for equipment shutdown, interface between Fire Alarm system and elevator control systems for elevator recall and shutdown; interface between Fire Alarm System and Security Access Control Systems to control access to spaces during fire alarm conditions; and other similar tests as determined for each specific project.

Issues Log: A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

Lessons Learned Workshop: A workshop conducted to discuss and document project successes and identify opportunities for improvements for future projects.

Maintainability: A design component or construction process that will allow a system or component to be effectively maintained. This includes adequate room for access to adjust and repair the equipment.

Maintainability also includes components that have readily obtainable repair parts or service.

Manual Test: Testing using hand-held instruments, immediate control system readouts or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the 'observation').

Owner's Project Requirements (OPR): A written document that details the project requirements and the expectations of how the building and its systems will be used and operated. These include project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

Peer Review: A formal in-depth review separate from the commissioning review processes. The level of effort and intensity is much greater than a typical commissioning facilitation or extended commissioning review. The VA usually hires an independent third-party (called the IDIQ A/E) to conduct peer reviews.

Precision: The ability of an instrument to produce repeatable readings of the same quantity under the same conditions. The precision of an instrument refers to its ability to produce a tightly grouped set of values around the mean value of the measured quantity.

Pre-Design Phase Commissioning: Commissioning tasks performed prior to the commencement of design activities that includes project programming and the development of the commissioning process for the project

Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are onsite, correctly installed, set up, calibrated, functional and ready for functional testing.

Pre-Functional Test (PFT): An inspection or test that is done before functional testing. PFT's include installation verification and system and component start up tests.

Procedure or Protocol: A defined approach that outlines the execution of a sequence of work or operations. Procedures are used to produce repeatable and defined results.

Range: The upper and lower limits of an instrument's ability to measure the value of a quantity for which the instrument is calibrated.

Resolution: This word has two meanings in the Cx Process. The first refers to the smallest change in a measured variable that an instrument

can detect. The second refers to the implementation of actions that correct a tested or observed deficiency.

Site Observation Visit: On-site inspections and observations made by the Commissioning Agent for the purpose of verifying component, equipment, and system installation, to observe contractor testing, equipment start-up procedures, or other purposes.

Site Observation Reports (SO): Reports of site inspections and observations made by the Commissioning Agent. Observation reports are intended to provide early indication of an installation issue which will need correction or analysis.

Special System Inspections: Inspections required by a local code authority prior to occupancy and are not normally a part of the commissioning process.

Static Tests: Tests or inspections that validate a specified static condition such as pressure testing. Static tests may be specification or code initiated.

Start Up Tests: Tests that validate the component or system is ready for automatic operation in accordance with the manufactures requirements.

Systems Manual: A system-focused composite document that includes all information required for the owners operators to operate the systems.

Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

Testing: The use of specialized and calibrated instruments to measure parameters such as: temperature, pressure, vapor flow, air flow, fluid flow, rotational speed, electrical characteristics, velocity, and other data in order to determine performance, operation, or function.

Testing, Adjusting, and Balancing (TAB): A systematic process or service applied to heating, ventilating and air-conditioning (HVAC) systems and other environmental systems to achieve and document air and hydronic flow rates. The standards and procedures for providing these services are referred to as “Testing, Adjusting, and Balancing” and are described in the Procedural Standards for the Testing, Adjusting and Balancing of Environmental Systems, published by NEBB or AABC.

Thermal Scans: Thermographic pictures taken with an Infrared Thermographic Camera. Thermographic pictures show the relative temperatures of objects and surfaces and are used to identify leaks, thermal bridging, thermal intrusion, electrical overload conditions, moisture containment, and insulation failure.

Training Plan: A written document that details, in outline form the expectations of the operator training. Training agendas should include instruction on how to obtain service, operate, startup, shutdown and maintain all systems and components of the project.

Trending: Monitoring over a period of time with the building automation system.

Unresolved Commissioning Issue: Any Commissioning Issue that, at the time that the Final Report or the Amended Final Report is issued that has not been either resolved by the construction team or accepted by the VA. Validation: The process by which work is verified as complete and operating correctly:

1. First party validation occurs when a firm or individual verifying the task is the same firm or individual performing the task.
2. Second party validation occurs when the firm or individual verifying the task is under the control of the firm performing the task or has other possibilities of financial conflicts of interest in the resolution (Architects, Designers, General Contractors and Third Tier Subcontractors or Vendors).
3. Third party validation occurs when the firm verifying the task is not associated with or under control of the firm performing or designing the task.

Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner’s Project Requirements.

Warranty Phase Commissioning: Commissioning efforts executed after a project has been completed and accepted by the Owner. Warranty Phase Commissioning includes follow-up on verification of system performance, measurement and verification tasks and assistance in identifying

warranty issues and enforcing warranty provisions of the construction contract.

Warranty Visit: A commissioning meeting and site review where all outstanding warranty issues and deferred testing is reviewed and discussed.

Whole Building Commissioning: Commissioning of building systems such as Building Envelope, HVAC, Electrical, Special Electrical (Fire Alarm, Security & Communications), Plumbing and Fire Protection as described in this specification.

1.7 SYSTEMS TO BE COMMISSIONED

A. Commissioning of a system or systems specified for this project is part of the construction process. Documentation and testing of these systems, as well as training of the VA's Operation and Maintenance personnel, is required in cooperation with the VA and the Commissioning Agent.

B. The following systems will be commissioned as part of this project:

Systems To Be Commissioned	
System	**Description**
Building Exterior Closure	
Note:	The emphasis on commissioning the above building envelope systems is on control of air flow, heat flow, noise, infrared, ultraviolet, rain penetration, moisture, durability, security, reliability, constructability, maintainability, and sustainability.
Specialties	
Conveying Equipment	
Fire Suppression	
Fire Pump	Fire Pump, jockey pump, fire pump controller/ATS
Fire Sprinkler Systems	Wet pipe system, dry pipe system, pre-action system, special agent systems

Systems To Be Commissioned	
System	**Description**
HVAC	
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Air Handlers will be commissioned as part of the system commissioning
Direct Digital Control System**	Operator Interface Computer, Operator Work Station (including graphics, point mapping, trends, alarms), Network Communications Modules and Wiring, Integration Panels. [DDC Control panels will be commissioned with the systems controlled by the panel]
HVAC Air Handling Systems**	Air handling Units, Outdoor Air conditioning units, humidifiers, DDC control panels
HVAC Ventilation/Exhaust Systems	General exhaust, toilet exhaust
HVAC Energy Recovery Systems**	AHU Integrated Heat Recovery, Static Plate Heat and Humidity Transfer
HVAC Terminal Unit Systems**	VAV Terminal Units, CAV terminal units
Humidity Control Systems	Humidifiers, controls, interface with facility DDC
Electrical	
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Electrical System Protective Device Study	Review reports, verify field settings consistent with Study

Systems To Be Commissioned	
System	**Description**
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, critical power distribution system, equipment power distribution system, switchboards, distribution panels, panelboards, verify breaker testing results (injection current, etc)
Lighting & Lighting Control** Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, theatrical dimming systems, exterior lighting and controls
Communications	
Public Address & Mass Notification Systems	Witness 3rd party testing, review reports
Nurse Call & Code Blue Systems	Witness 3rd party testing, review reports
Duress Alarm Systems	Witness 3rd party testing, review reports
Electronic Safety and Security	
Grounding & Bonding	Witness 3rd party testing, review reports
Access Control Systems	Witness 3rd party testing, review reports
Video Surveillance System	Witness 3rd party testing, review reports
Electronic Personal Protection System	Witness 3rd party testing, review reports
Fire Detection and Alarm System	100% device acceptance testing, battery draw-down test, verify system monitoring, verify interface with other systems.
Renewable Energy Sources	
Site Utilities	

Systems To Be Commissioned	
System	**Description**
Transportation	
Integrated Systems Tests	
Loss of Power Response	Loss of power to building, loss of power to campus, restoration of power to building, restoration of power to campus.
Fire Alarm Response	Integrated System Response to Fire Alarm Condition and Return to Normal
Table Notes	
** Denotes systems that LEED requires to be commissioned to comply with the LEED Fundamental Commissioning pre-requisite.	

1.8 COMMISSIONING TEAM

A. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, schedulers, suppliers, and specialists deemed appropriate by the Department of Veterans Affairs (VA) and Commissioning Agent.

B. Members Appointed by Contractor:

1. Contractor' Commissioning Manager: The designated person, company, or entity that plans, schedules and coordinates the commissioning activities for the construction team.
2. Contractor's Commissioning Representative(s): Individual(s), each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.

C. Members Appointed by VA:

1. Commissioning Agent: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. The VA will engage the CxA under a separate contract.
2. User: Representatives of the facility user and operation and maintenance personnel.

3. A/E: Representative of the Architect and engineering design professionals.

1.9 VA'S COMMISSIONING RESPONSIBILITIES

A. Appoint an individual, company or firm to act as the Commissioning Agent.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities including, but not limited to, the following:
   1. Coordination meetings.
   2. Training in operation and maintenance of systems, subsystems, and equipment.
   3. Testing meetings.
   4. Witness and assist in Systems Functional Performance Testing.
   5. Demonstration of operation of systems, subsystems, and equipment.

C. Provide the Construction Documents, prepared by Architect and approved by VA, to the Commissioning Agent and for use in managing the commissioning process, developing the commissioning plan, systems manuals, and reviewing the operation and maintenance training plan.

1.10 CONTRACTOR'S COMMISSIONING RESPONSIBILITIES

A. The Contractor shall assign a Commissioning Manager to manage commissioning activities of the Contractor, and subcontractors.

B. The Contractor shall ensure that the commissioning responsibilities outlined in these specifications are included in all subcontracts and that subcontractors comply with the requirements of these specifications.

C. The Contractor shall ensure that each installing subcontractor shall assign representatives with expertise and authority to act on behalf of the subcontractor and schedule them to participate in and perform commissioning team activities including, but not limited to, the following:
   1. Participate in commissioning coordination meetings.
   2. Conduct operation and maintenance training sessions in accordance with approved training plans.

3. Verify that Work is complete and systems are operational according to the Contract Documents, including calibration of instrumentation and controls.
4. Evaluate commissioning issues and commissioning observations identified in the Commissioning Issues Log, field reports, test reports or other commissioning documents. In collaboration with entity responsible for system and equipment installation, recommend corrective action.
5. Review and comment on commissioning documentation.
6. Participate in meetings to coordinate Systems Functional Performance Testing.
7. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
8. Provide information to the Commissioning Agent for developing commissioning plan.
9. Participate in training sessions for VA's operation and maintenance personnel.
10. Provide technicians who are familiar with the construction and operation of installed systems and who shall develop specific test procedures to conduct Systems Functional Performance Testing of installed systems.

1.11 COMMISSIONING AGENT'S RESPONSIBILITIES

A. Organize and lead the commissioning team.

B. Prepare the commissioning plan. See Paragraph 1.11-A of this specification Section for further information.

C. Review and comment on selected submittals from the Contractor for general conformance with the Construction Documents. Review and comment on the ability to test and operate the system and/or equipment, including providing gages, controls and other components required to operate, maintain, and test the system. Review and comment on performance expectations of systems and equipment and interfaces between systems relating to the Construction Documents.

D. At the beginning of the construction phase, conduct an initial construction phase coordination meeting for the purpose of reviewing

the commissioning activities and establishing tentative schedules for operation and maintenance submittals; operation and maintenance training sessions; TAB Work; Pre-Functional Checklists, Systems Functional Performance Testing; and project completion.

E. Convene commissioning team meetings for the purpose of coordination, communication, and conflict resolution; discuss status of the commissioning processes. Responsibilities include arranging for facilities, preparing agenda and attendance lists, and notifying participants. The Commissioning Agent shall prepare and distribute minutes to commissioning team members and attendees within five workdays of the commissioning meeting.

F. Observe construction and report progress, observations and issues. Observe systems and equipment installation for adequate accessibility for maintenance and component replacement or repair, and for general conformance with the Construction Documents.

G. Prepare Project specific Pre-Functional Checklists and Systems Functional Performance Test procedures.

H. Coordinate Systems Functional Performance Testing schedule with the Contractor.

I. Witness selected systems startups.

J. Verify selected Pre-Functional Checklists completed and submitted by the Contractor.

K. Witness and document Systems Functional Performance Testing.

L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.

M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.

N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.

O. Prepare commissioning Field Observation Reports.

P. Prepare the Final Commissioning Report.

Q. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.

R. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

1.12 COMMISSIONING DOCUMENTATION

A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:

1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.
2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
3. Identification of systems and equipment to be commissioned.
4. Schedule of Commissioning Coordination meetings.
5. Identification of items that must be completed before the next operation can proceed.
6. Description of responsibilities of commissioning team members.
7. Description of observations to be made.
8. Description of requirements for operation and maintenance training.

9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
12. Preliminary Systems Functional Performance Test procedures.

B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:

1. Name and identification code of tested system.
2. Test number.
3. Time and date of test.
4. Indication of whether the record is for a first test or retest following correction of a problem or issue.
5. Dated signatures of the person performing test and of the witness, if applicable.
6. Individuals present for test.
7. Observations and Issues.
8. Issue number, if any, generated as the result of test.

C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify

accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.

D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.

E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.

F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master Commissioning Issues Log will also track the status of unresolved issues.

1. Creating an Commissioning Issues Log Entry:
   a. Identify the issue with unique numeric or alphanumeric identifier by which the issue may be tracked.
   b. Assign a descriptive title for the issue.
   c. Identify date and time of the issue.

d. Identify test number of test being performed at the time of the observation, if applicable, for cross reference.
e. Identify system, subsystem, and equipment to which the issue applies.
f. Identify location of system, subsystem, and equipment.
g. Include information that may be helpful in diagnosing or evaluating the issue.
h. Note recommended corrective action.
i. Identify commissioning team member responsible for corrective action.
j. Identify expected date of correction.
k. Identify person that identified the issue.

2. Documenting Issue Resolution:
a. Log date correction is completed or the issue is resolved.
b. Describe corrective action or resolution taken. Include description of diagnostic steps taken to determine root cause of the issue, if any.
c. Identify changes to the Contract Documents that may require action.
d. State that correction was completed and system, subsystem, and equipment are ready for retest, if applicable.
e. Identify person(s) who corrected or resolved the issue.
f. Identify person(s) verifying the issue resolution.

G. Final Commissioning Report: The Commissioning Agent will document results of the commissioning process, including unresolved issues, and performance of systems, subsystems, and equipment. The Commissioning Report will indicate whether systems, subsystems, and equipment have been properly installed and are performing according to the Contract Documents. This report will be used by the Department of Veterans Affairs when determining that systems will be accepted. This report will be used to evaluate systems, subsystems, and equipment and will serve as a future reference document during VA occupancy and operation. It shall describe components and performance that exceed requirements of the Contract Documents and those that do not meet requirements of

the Contract Documents. The commissioning report will include, but is not limited to, the following:

1. Lists and explanations of substitutions; compromises; variances with the Contract Documents; record of conditions; and, if appropriate, recommendations for resolution. Design Narrative documentation maintained by the Commissioning Agent.
2. Commissioning plan.
3. Pre-Functional Checklists completed by the Contractor, with annotation of the Commissioning Agent review and spot check.
4. Systems Functional Performance Test Procedures, with annotation of test results and test completion.
5, Commissioning Issues Log.
6. Listing of deferred and off season test(s) not performed, including the schedule for their completion.

H. Addendum to Final Commissioning Report: The Commissioning Agent will prepare an Addendum to the Final Commissioning Report near the end of the Warranty Period. The Addendum will indicate whether systems, subsystems, and equipment are complete and continue to perform according to the Contract Documents. The Addendum to the Final Commissioning Report shall include, but is not limited to, the following:

1. Documentation of deferred and off season test(s) results.
2. Completed Systems Functional Performance Test Procedures for off season test(s).
3. Documentation that unresolved system performance issues have been resolved.
4. Updated Commissioning Issues Log, including status of unresolved issues.
5. Identification of potential Warranty Claims to be corrected by the Contractor.

I. Systems Manual: The Commissioning Agent will gather required information and compile the Systems Manual. The Systems Manual will include, but is not limited to, the following:

1. Design Narrative, including system narratives, schematics, single-line diagrams, flow diagrams, equipment schedules, and changes made throughout the Project.
2. Reference to Final Commissioning Plan.
3. Reference to Final Commissioning Report.
4. Approved Operation and Maintenance Data as submitted by the Contractor.

1.13 SUBMITTALS

A. Preliminary Commissioning Plan Submittal: The Commissioning Agent has prepared a Preliminary Commissioning Plan based on the final Construction Documents. The Preliminary Commissioning Plan is included as an Appendix to this specification section. The Preliminary Commissioning Plan is provided for information only. It contains preliminary information about the following commissioning activities:

1. The Commissioning Team: A list of commissioning team members by organization.
2. Systems to be commissioned. A detailed list of systems to be commissioned for the project. This list also provides preliminary information on systems/equipment submittals to be reviewed by the Commissioning Agent; preliminary information on Pre-Functional Checklists that are to be completed; preliminary information on Systems Performance Testing, including information on testing sample size (where authorized by the VA).
3. Commissioning Team Roles and Responsibilities: Preliminary roles and responsibilities for each Commissioning Team member.
4. Commissioning Documents: A preliminary list of commissioning-related documents, include identification of the parties responsible for preparation, review, approval, and action on each document.
5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide

guidance on the level of detailed information the Contractor shall include on the final submission.

7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.

B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.

C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor shall return review comments to the VA and the Commissioning Agent. The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.

D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.

E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.

F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA COR with copies to the Contractor and Architect.

G. Preliminary Commissioning Report Submittal: The Commissioning Agent will submit three electronic copies of the preliminary commissioning

report. One electronic copy, with review comments, will be returned to the Commissioning Agent for preparation of the final submittal.

H. Final Commissioning Report Submittal: The Commissioning Agent will submit four sets of electronically formatted information of the final commissioning report to the VA. The final submittal will incorporate comments as directed by the VA.

I. Data for Commissioning:

1. The Commissioning Agent will request in writing from the Contractor specific information needed about each piece of commissioned equipment or system to fulfill requirements of the Commissioning Plan.
2. The Commissioning Agent may request further documentation as is necessary for the commissioning process or to support other VA data collection requirements, including Construction Operations Building Information Exchange (COBIE), Building Information Modeling (BIM), etc.

1.14 COMMISSIONING PROCESS

A. The Commissioning Agent will be responsible for the overall management of the commissioning process as well as coordinating scheduling of commissioning tasks with the VA and the Contractor. As directed by the VA, the Contractor shall incorporate Commissioning tasks, including, but not limited to, Systems Functional Performance Testing (including predecessors) with the Master Construction Schedule.

B. Within 14 days of contract award, the Contractor shall designate a specific individual as the Commissioning Manager (CxM) to manage and lead the commissioning effort on behalf of the Contractor. The Commissioning Manager shall be the single point of contact and communications for all commissioning related services by the Contractor.

C. Within 14 days of contract award, the Contractor shall ensure that each subcontractor designates specific individuals as Commissioning Representatives (CXR) to be responsible for commissioning related tasks. The Contractor shall ensure the designated Commissioning Representatives participate in the commissioning process as team

members providing commissioning testing services, equipment operation, adjustments, and corrections if necessary. The Contractor shall ensure that all Commissioning Representatives shall have sufficient authority to direct their respective staff to provide the services required, and to speak on behalf of their organizations in all commissioning related contractual matters.

1.15 QUALITY ASSURANCE

A. Instructor Qualifications: Factory authorized service representatives shall be experienced in training, operation, and maintenance procedures for installed systems, subsystems, and equipment.

B. Test Equipment Calibration: The Contractor shall comply with test equipment manufacturer's calibration procedures and intervals. Recalibrate test instruments immediately whenever instruments have been repaired following damage or dropping. Affix calibration tags to test instruments. Instruments shall have been calibrated within six months prior to use.

1.16 COORDINATION

A. Management: The Commissioning Agent will coordinate the commissioning activities with the VA and Contractor. The Commissioning Agent will submit commissioning documents and information to the VA. All commissioning team members shall work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.

B. Scheduling: The Contractor shall work with the Commissioning Agent and the VA to incorporate the commissioning activities into the construction schedule. The Commissioning Agent will provide sufficient information (including, but not limited to, tasks, durations and predecessors) on commissioning activities to allow the Contractor and the VA to schedule commissioning activities. All parties shall address scheduling issues and make necessary notifications in a timely manner in order to expedite the project and the commissioning process. The Contractor shall update the Master Construction as directed by the VA.

C. Initial Schedule of Commissioning Events: The Commissioning Agent will provide the initial schedule of primary commissioning events in the Commissioning Plan and at the commissioning coordination meetings. The

Commissioning Plan will provide a format for this schedule. As construction progresses, more detailed schedules will be developed by the Contractor with information from the Commissioning Agent.

D. Commissioning Coordinating Meetings: The Commissioning Agent will conduct periodic Commissioning Coordination Meetings of the commissioning team to review status of commissioning activities, to discuss scheduling conflicts, and to discuss upcoming commissioning process activities.

E. Pretesting Meetings: The Commissioning Agent will conduct pretest meetings of the commissioning team to review startup reports, Pre-Functional Checklist results, Systems Functional Performance Testing procedures, testing personnel and instrumentation requirements.

F. Systems Functional Performance Testing Coordination: The Contractor shall coordinate testing activities to accommodate required quality assurance and control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting. The Contractor shall coordinate the schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. The Contractor shall provide all standard and specialized testing equipment required to perform Systems Functional Performance Testing. Test equipment required for Systems Functional Performance Testing will be identified in the detailed System Functional Performance Test Procedure prepared by the Commissioning Agent.

B. Data logging equipment and software required to test equipment shall be provided by the Contractor.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications. If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5 °C (1.0 °F) and a resolution of + or - 0.1 °C (0.2 °F). Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last

year. All equipment shall be calibrated according to the manufacturer's recommended intervals and following any repairs to the equipment. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS ROLES AND RESPONSIBILITIES

A. The following table outlines the roles and responsibilities for the Commissioning Team members during the Construction Phase:

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Construction Commissioning Kick Off meeting	L	A	P	P	O	
	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Controls Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support the OPR and BOD.	L	A	P	P	N/A	
Cx Plan & Spec	Final Commissioning Plan	L	A	R	R	O	

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Construction Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Schedules	Duration Schedule for Commissioning Activities	L	A	R	R	N/A	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	TAB Plan Review	L	A	R	R	O	
	Submittal and Shop Drawing Review	R	A	R	L	O	
	Review Contractor Equipment Startup Checklists	L	A	R	R	N/A	
	Review Change Orders, ASI, and RFI	L	A	R	R	N/A	
Site Observations	Witness Factory Testing	P	A	P	L	O	
	Construction Observation Site Visits	L	A	R	R	O	
Functional	Final Pre-Functional Checklists	L	A	R	R	O	

Construction Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Test Protocols	Final Functional Performance Test Protocols	L	A	R	R	O	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	

B. The following table outlines the roles and responsibilities for the Commissioning Team members during the Acceptance Phase:

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes

Acceptance Phase		CxA = Commissioning Agent RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					L = Lead P = Participate A = Approve R = Review O = Optional
Commissioning Roles & Responsibilities							
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Commissioning Meetings	L	A	P	P	O	
	Project Progress Meetings	P	A	P	L	O	
	Pre-Test Coordination Meeting	L	A	P	P	O	
	Lessons Learned and Commissioning Report Review Meeting	L	A	P	P	O	
Coordination	Coordinate with [OGC's, AHJ, Vendors, etc.] to ensure that Cx interacts properly with other systems as needed to support OPR and BOD	L	P	P	P	O	
Cx Plan & Spec	Maintain/Update Commissioning Plan	L	A	R	R	O	
Schedules	Prepare Functional Test Schedule	L	A	R	R	O	
OPR and BOD	Maintain OPR on behalf of Owner	L	A	R	R	O	
	Maintain BOD/DID on behalf of Owner	L	A	R	R	O	
Document Reviews	Review Completed Pre-Functional Checklists	L	A	R	R	O	
	Pre-Functional Checklist Verification	L	A	R	R	O	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
	Review Operations & Maintenance Manuals	L	A	R	R	R	
	Training Plan Review	L	A	R	R	R	
	Warranty Review	L	A	R	R	O	
	Review TAB Report	L	A	R	R	O	
Site Observations	Construction Observation Site Visits	L	A	R	R	O	
	Witness Selected Equipment Startup	L	A	R	R	O	
Functional Test Protocols	TAB Verification	L	A	R	R	O	
	Systems Functional Performance Testing	L	A	P	P	P	
	Retesting	L	A	P	P	P	
Technical Activities	Issues Resolution Meetings	P	A	P	L	O	
	Systems Training	L	S	R	P	P	
Reports and Logs	Status Reports	L	A	R	R	O	
	Maintain Commissioning Issues Log	L	A	R	R	O	
	Final Commissioning Report	L	A	R	R	R	
	Prepare Systems Manuals	L	A	R	R	R	

Acceptance Phase		CxA = Commissioning Agent					L = Lead
Commissioning Roles & Responsibilities		RE = Resident Engineer					P = Participate
		A/E = Design Arch/Engineer					A = Approve
		PC = Prime Contractor					R = Review
		O&M = Gov't Facility O&M					O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes

C. The following table outlines the roles and responsibilities for the Commissioning Team members during the Warranty Phase:

Warranty Phase	CxA = Commissioning Agent	L = Lead

Commissioning Roles & Responsibilities		RE = Resident Engineer A/E = Design Arch/Engineer PC = Prime Contractor O&M = Gov't Facility O&M					P = Participate A = Approve R = Review O = Optional
Category	Task Description	CxA	RE	A/E	PC	O&M	Notes
Meetings	Post-Occupancy User Review Meeting	L	A	O	P	P	
Site Observations	Periodic Site Visits	L	A	O	O	P	
Functional Test Protocols	Deferred and/or seasonal Testing	L	A	O	P	P	
Technical Activities	Issues Resolution Meetings	L	S	O	O	P	
	Post-Occupancy Warranty Checkup and review of Significant Outstanding Issues	L	A		R	P	
Reports and Logs	Final Commissioning Report Amendment	L	A		R	R	
	Status Reports	L	A		R	R	

3.2 STARTUP, INITIAL CHECKOUT, AND PRE-FUNCTIONAL CHECKLISTS

A. The following procedures shall apply to all equipment and systems to be commissioned, according to Part 1, Systems to Be Commissioned.

1. Pre-Functional Checklists are important to ensure that the equipment and systems are hooked up and operational. These ensure that Systems Functional Performance Testing may proceed without unnecessary delays. Each system to be commissioned shall have a full Pre-Functional Checklist completed by the Contractor prior to Systems Functional Performance Testing. No sampling strategies are used.
   a. The Pre-Functional Checklist will identify the trades responsible for completing the checklist. The Contractor shall ensure the appropriate trades complete the checklists.
   b. The Commissioning Agent will review completed Pre-Functional Checklists and field-verify the accuracy of the completed checklist using sampling techniques.
2. Startup and Initial Checkout Plan: The Contractor shall develop detailed startup plans for all equipment. The primary role of the Contractor in this process is to ensure that there is written documentation that each of the manufacturer recommended procedures have been completed. Parties responsible for startup shall be identified in the Startup Plan and in the checklist forms.
   a. The Contractor shall develop the full startup plan by combining (or adding to) the checklists with the manufacturer's detailed startup and checkout procedures from the O&M manual data and the field checkout sheets normally used by the Contractor. The plan shall include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.
   b. The full startup plan shall at a minimum consist of the following items:
      1) The Pre-Functional Checklists.
      2) The manufacturer's standard written startup procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand at the end.

3) The manufacturer's normally used field checkout sheets.

c. The Commissioning Agent will submit the full startup plan to the VA and Contractor for review. Final approval will be by the VA.

d. The Contractor shall review and evaluate the procedures and the format for documenting them, noting any procedures that need to be revised or added.

3. Sensor and Actuator Calibration

a. All field installed temperature, relative humidity, CO2 and pressure sensors and gages, and all actuators (dampers and valves) on all equipment shall be calibrated using the methods described in Division 21, Division 22, Division 23, Division 26, Division 27, and Division 28 specifications.

b. All procedures used shall be fully documented on the Pre-Functional Checklists or other suitable forms, clearly referencing the procedures followed and written documentation of initial, intermediate and final results.

4. Execution of Equipment Startup

a. Four weeks prior to equipment startup, the Contractor shall schedule startup and checkout with the VA and Commissioning Agent. The performance of the startup and checkout shall be directed and executed by the Contractor.

b. The Commissioning Agent will observe the startup procedures for selected pieces of primary equipment.

c. The Contractor shall execute startup and provide the VA and Commissioning Agent with a signed and dated copy of the completed startup checklists, and contractor tests.

d. Only individuals that have direct knowledge and witnessed that a line item task on the Startup Checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

3.3 DEFICIENCIES, NONCONFORMANCE, AND APPROVAL IN CHECKLISTS AND STARTUP

A. The Contractor shall clearly list any outstanding items of the initial startup and Pre-Functional Checklist procedures that were not completed successfully, at the bottom of the procedures form or on an attached

sheet. The procedures form and any outstanding deficiencies shall be provided to the VA and the Commissioning Agent within two days of completion.

B. The Commissioning Agent will review the report and submit comments to the VA. The Commissioning Agent will work with the Contractor to correct and verify deficiencies or uncompleted items. The Commissioning Agent will involve the VA and others as necessary. The Contractor shall correct all areas that are noncompliant or incomplete in the checklists in a timely manner, and shall notify the VA and Commissioning Agent as soon as outstanding items have been corrected. The Contractor shall submit an updated startup report and a Statement of Correction on the original noncompliance report. When satisfactorily completed, the Commissioning Agent will recommend approval of the checklists and startup of each system to the VA.

C. The Contractor shall be responsible for resolution of deficiencies as directed the VA.

3.4 PHASED COMMISSIONING

A. The project may require startup and initial checkout to be executed in phases. This phasing shall be planned and scheduled in a coordination meeting of the VA, Commissioning Agent, and the Contractor. Results will be added to the master construction schedule and the commissioning schedule.

3.5 DDC SYSTEM TRENDING FOR COMMISSIONING

A. Trending is a method of testing as a standalone method or to augment manual testing. The Contractor shall trend any and all points of the system or systems at intervals specified below.

B. Alarms are a means to notify the system operator that abnormal conditions are present in the system. Alarms shall be structured into three tiers – Critical, Priority, and Maintenance.

1. Critical alarms are intended to be alarms that require the immediate attention of and action by the Operator. These alarms shall be displayed on the Operator Workstation in a popup style window that is graphically linked to the associated unit's graphical display.

The popup style window shall be displayed on top of any active window within the screen, including non DDC system software.

2. Priority level alarms are to be printed to a printer which is connected to the Operator's Work Station located within the engineer's office. Additionally Priority level alarms shall be able to be monitored and viewed through an active alarm application. Priority level alarms are alarms which shall require reaction from the operator or maintenance personnel within a normal work shift, and not immediate action.
3. Maintenance alarms are intended to be minor issues which would require examination by maintenance personnel within the following shift. These alarms shall be generated in a scheduled report automatically by the DDC system at the start of each shift. The generated maintenance report will be printed to a printer located within the engineer's office.

C. The Contractor shall provide a wireless internet network in the building for use during controls programming, checkout, and commissioning. This network will allow project team members to more effectively program, view, manipulate and test control devices while being in the same room as the controlled device.

D. The Contractor shall provide graphical trending through the DDC control system of systems being commissioned. Trending requirements are indicated below and included with the Systems Functional Performance Test Procedures. Trending shall occur before, during and after Systems Functional Performance Testing. The Contractor shall be responsible for producing graphical representations of the trended DDC points that show each system operating properly during steady state conditions as well as during the System Functional Testing. These graphical reports shall be submitted to the COR and Commissioning Agent for review and analysis before, during dynamic operation, and after Systems Functional Performance Testing. The Contractor shall provide, but not limited to, the following trend requirements and trend submissions:

1. Pre-testing, Testing, and Post-testing – Trend reports of trend logs and graphical trend plots are required as defined by the Commissioning Agent. The trend log points, sampling rate, graphical

plot configuration, and duration will be dictated by the Commissioning Agent. At any time during the Commissioning Process the Commissioning Agent may recommend changes to aspects of trending as deemed necessary for proper system analysis. The Contractor shall implement any changes as directed by the COR. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the COR, prior to the execution of Systems Functional Performance Testing.

2. Dynamic plotting – The Contractor shall also provide dynamic plotting during Systems Functional Performance testing at frequent intervals for points determined by the Systems Functional Performance Test Procedure. The graphical plots will be formatted and plotted at durations listed in the Systems Functional Performance Test Procedure.
3. Graphical plotting - The graphical plots shall be provided with a dual y-axis allowing 15 or more trend points (series) plotted simultaneously on the graph with each series in distinct color. The plots will further require title, axis naming, legend etc. all described by the Systems Functional Performance Test Procedure. If this cannot be sufficiently accomplished directly in the Direct Digital Control System then it is the responsibility of the Contractor to plot these trend logs in Microsoft Excel.
4. The following tables indicate the points to be trended and alarmed by system. The Operational Trend Duration column indicates the trend duration for normal operations. The Testing Trend Duration column indicates the trend duration prior to Systems Functional Performance Testing and again after Systems Functional Performance Testing. The Type column indicates point type: AI = Analog Input, AO = Analog Output, DI = Digital Input, DO = Digital Output, Calc = Calculated Point. In the Trend Interval Column, COV = Change of Value. The Alarm Type indicates the alarm priority; C = Critical, P = Priority, and M = Maintenance. The Alarm Range column indicates when the point is considered in the alarm state. The Alarm Delay column indicates the length of time the point must remain in an alarm state before the alarm is recorded in the DDC. The intent is

to allow minor, short-duration events to be corrected by the DDC system prior to recording an alarm.

Dual-Path Air Handling Unit Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
OA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Temperature	AI	15 Min	24 hours	3 days	N/A		
RA Humidity	AI	15 Min	24 hours	3 days	P	>60% RH	10 min
Mixed Air Temp	AI	None	None	None	N/A		
SA Temp	AI	15 Min	24 hours	3 days	C	±5°F from SP	10 min
Supply Fan Speed	AI	15 Min	24 hours	3 days	N/A		
Return Fan Speed	AI	15 Min	24 hours	3 days	N/A		
RA Pre-Filter Status	AI	None	None	None	N/A		
OA Pre-Filter Status	AI	None	None	None	N/A		
After Filter Status	AI	None	None	None	N/A		
SA Flow	AI	15 Min	24 hours	3 days	C	±10% from SP	10 min
OA Supply Temp	AI	15 Min	24 hours	3 days	P	±5°F from SP	10 min
RA Supply Temp	AI	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AI	15 Min	24 hours	3 days	N/A		
OA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
RA Flow	AI	15 Min	24 hours	3 days	P	±10% from SP	5 min
Initial UVC Intensity (%)	AI	None	None	None	N/A		
Duct Pressure	AI	15 Min	24 hours	3 days	C	±25% from SP	6 min

Dual-Path Air Handling Unit Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
CO2 Level	AI	15 Min	24 hours	3 days	P	±10% from SP	10 min
Supply Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Return Fan Status	DI	COV	24 hours	3 days	C	Status <> Command	10 Min
High Static Status	DI	COV	24 hours	3 days	P	True	1 min
Fire Alarm Status	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 1	DI	COV	24 hours	3 days	C	True	10 min
Freeze Stat Level 2	DI	COV	24 hours	3 days	C	True	5 min
Freeze Stat Level 3	DI	COV	24 hours	3 days	P	True	1 min
Fire/Smoke Damper Status	DI	COV	24 hours	3 days	P	Closed	1 min
Emergency AHU Shutdown	DI	COV	24 hours	3 days	P	True	1 min
Exhaust Fan #1 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #2 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
Exhaust Fan #3 Status	DI	COV	24 hours	3 days	C	Status <> Command	10 min
OA Alarm	DI	COV	24 hours	3 days	C	True	10 min
High Static Alarm	DI	COV	24 hours	3 days	C	True	10 min
UVC Emitter Alarm	DI	COV	24 hours	3 days	P	True	10 min
CO2 Alarm	DI	COV	24 hours	3 days	P	True	10 min
Power Failure	DI	COV	24 hours	3 days	P	True	1 min
Supply Fan Speed	AO	15 Min	24 hours	3 days	N/A		

Dual-Path Air Handling Unit Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
Return Fan Speed	AO	15 Min	24 hours	3 days	N/A		
RA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA CHW Valve Position	AO	15 Min	24 hours	3 days	N/A		
OA HW Valve Position	AO	15 Min	24 hours	3 days	N/A		
Supply Fan S/S	DO	COV	24 hours	3 days	N/A		
Return Fan S/S	DO	COV	24 hours	3 days	N/A		
Fire/Smoke Dampers	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
Exhaust Fan S/S	DO	COV	24 hours	3 days	N/A		
AHU Energy	Calc	1 Hour	30 day	N/A	N/A		

Terminal Unit (VAV, CAV, etc.) Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
Space Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Air Flow	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
SA Temperature	AI	15 Min	12 hours	3 days	P	±5°F from SP	10 min
Local Setpoint	AI	15 Min	12 hours	3 days	M	±10°F from SP	60 min
Space Humidity	AI	15 Min	12 hours	3 days	P	> 60% RH	5 min

Terminal Unit (VAV, CAV, etc.) Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
Unoccupied Override	DI	COV	12 hours	3 days	M	N/A	12 Hours
Refrigerator Alarm	DI	COV	12 hours	3 days	C	N/A	10 min
Damper Position	AO	15 Minutes	12 hours	3 days	N/A		
Heating coil Valve Position	AO	15 Minutes	12 hours	3 days	N/A		

Domestic Hot Water Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
Domestic HW Setpoint WH-1	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Setpoint WH-2	AI	15 Minute	12 Hours	3 days	N/A		
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	C	> 135 oF	10 Min
Domestic HW Temperature	AI	15 Minute	12 Hours	3 days	P	±5°F from SP	10 Min

Domestic Hot Water Trending and Alarms							
Point	**Type**	**Trend Interval**	**Operational Trend Duration**	**Testing Trend Duration**	**Alarm Type**	**Alarm Range**	**Alarm Delay**
Dom. Circ. Pump #1 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #2 Status	DI	COV	12 Hours	3 days	M	Status <> Command	30 min
Dom. Circ. Pump #1 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Dom. Circ. Pump #2 Start/Stop	DO	COV	12 Hours	3 days	N/A		
Domestic HW Start/Stop	DO	COV	12 Hours	3 days	N/A		

E. The Contractor shall provide the following information prior to Systems Functional Performance Testing. Any documentation that is modified after submission shall be recorded and resubmitted to the COR and Commissioning Agent.

1. Point-to-Point checkout documentation;
2. Sensor field calibration documentation including system name, sensor/point name, measured value, DDC value, and Correction Factor.
3. A sensor calibration table listing the referencing the location of procedures to following in the O&M manuals, and the frequency at which calibration should be performed for all sensors, separated by system, subsystem, and type. The calibration requirements shall be submitted both in the O&M manuals and separately in a standalone document containing all sensors for inclusion in the commissioning documentation. The following table is a sample that can be used as a template for submission.

SYSTEM		
Sensor	**Calibration Frequency**	**O&M Calibration Procedure Reference**
Discharge air temperature	Once a year	Volume I Section D.3.aa
Discharge static pressure	Every 6 months	Volume II Section A.1.c

4. Loop tuning documentation and constants for each loop of the building systems. The documentation shall be submitted in outline or table separated by system, control type (e.g. heating valve temperature control); proportional, integral and derivative constants, interval (and bias if used) for each loop. The following table is a sample that can be used as a template for submission.

AIR HANDLING UNIT AHU-1				
Control Reference	Proportional Constant	Integral Constant	Derivative Constant	Interval
Heating Valve Output	1000	20	10	2 sec.

3.6 SYSTEMS FUNCTIONAL PERFORMANCE TESTING

A. This paragraph applies to Systems Functional Performance Testing of systems for all referenced specification Divisions.

B. Objectives and Scope: The objective of Systems Functional Performance Testing is to demonstrate that each system is operating according to the Contract Documents. Systems Functional Performance Testing facilitates bringing the systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of noncompliant performance are identified and corrected, thereby improving the operation and functioning of the systems. In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, fire alarm and emergency power) where there is a specified system response. The Contractor shall verify each sequence in the sequences of operation. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested.

C. Development of Systems Functional Performance Test Procedures: Before Systems Functional Performance Test procedures are written, the Contractor shall submit all requested documentation and a current list of change orders affecting equipment or systems, including an updated points list, program code, control sequences and parameters. Using the testing parameters and requirements found in the Contract Documents and approved submittals and shop drawings, the Commissioning Agent will develop specific Systems Functional Test Procedures to verify and document proper operation of each piece of equipment and system to be commissioned. The Contractor shall assist the Commissioning Agent in developing the Systems Functional Performance Test procedures as requested by the Commissioning Agent i.e. by answering questions about equipment, operation, sequences, etc. Prior to execution, the Commissioning Agent will provide a copy of the Systems Functional Performance Test procedures to the VA, the Architect/Engineer, and the Contractor, who shall review the tests for feasibility, safety, equipment and warranty protection.

D. Purpose of Test Procedures: The purpose of each specific Systems Functional Performance Test is to verify and document compliance with the stated criteria of acceptance given on the test form. Representative test formats and examples are found in the Commissioning

Plan for this project. (The Commissioning Plan is issued as a separate document and is available for review.) The test procedure forms developed by the Commissioning Agent will include, but not be limited to, the following information:

1. System and equipment or component name(s)
2. Equipment location and ID number
3. Unique test ID number, and reference to unique Pre-Functional Checklists and startup documentation, and ID numbers for the piece of equipment
4. Date
5. Project name
6. Participating parties
7. A copy of the specification section describing the test requirements
8. A copy of the specific sequence of operations or other specified parameters being verified
9. Formulas used in any calculations
10. Required pretest field measurements
11. Instructions for setting up the test.
12. Special cautions, alarm limits, etc.
13. Specific step-by-step procedures to execute the test, in a clear, sequential and repeatable format
14. Acceptance criteria of proper performance with a Yes / No check box to allow for clearly marking whether or not proper performance of each part of the test was achieved.
15. A section for comments.
16. Signatures and date block for the Commissioning Agent. A place for the Contractor to initial to signify attendance at the test.

E. Test Methods: Systems Functional Performance Testing shall be achieved by manual testing (i.e. persons manipulate the equipment and observe performance) and/or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by standalone data loggers. The Contractor and Commissioning Agent shall determine which method is most appropriate for tests that do not have a method specified.

1. Simulated Conditions: Simulating conditions (not by an overwritten value) shall be allowed, although timing the testing to experience actual conditions is encouraged wherever practical.
2. Overwritten Values: Overwriting sensor values to simulate a condition, such as overwriting the outside air temperature reading in a control system to be something other than it really is, shall be allowed, but shall be used with caution and avoided when possible. Such testing methods often can only test a part of a system, as the interactions and responses of other systems will be erroneous or not applicable. Simulating a condition is preferable. e.g., for the above case, by heating the outside air sensor with a hair blower rather than overwriting the value or by altering the appropriate setpoint to see the desired response. Before simulating conditions or overwriting values, sensors, transducers and devices shall have been calibrated.
3. Simulated Signals: Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overwritten values.
4. Altering Setpoints: Rather than overwriting sensor values, and when simulating conditions is difficult, altering setpoints to test a sequence is acceptable. For example, to see the Air Conditioning compressor lockout initiate at an outside air temperature below 12 C (54 F), when the outside air temperature is above 12 C (54 F), temporarily change the lockout setpoint to be 2 C (4 F) above the current outside air temperature.
5. Indirect Indicators: Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the tested parameters, that the indirect readings through the control system represent actual conditions and responses. Much of this verification shall be completed during systems startup and initial checkout.

F. Setup: Each function and test shall be performed under conditions that simulate actual conditions as closely as is practically possible. The Contractor shall provide all necessary materials, system modifications,

etc. to produce the necessary flows, pressures, temperatures, etc. necessary to execute the test according to the specified conditions. At completion of the test, the Contractor shall return all affected building equipment and systems, due to these temporary modifications, to their pretest condition.

G. Sampling: No sampling is allowed in completing Pre-Functional Checklists. Sampling is allowed for Systems Functional Performance Test Procedures execution. The Commissioning Agent will determine the sampling rate. If at any point, frequent failures are occurring and testing is becoming more troubleshooting than verification, the Commissioning Agent may stop the testing and require the Contractor to perform and document a checkout of the remaining units, prior to continuing with Systems Functional Performance Testing of the remaining units.

H. Cost of Retesting: The cost associated with expanded sample System Functional Performance Tests shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

I. Coordination and Scheduling: The Contractor shall provide a minimum of 7 days' notice to the Commissioning Agent and the VA regarding the completion schedule for the Pre-Functional Checklists and startup of all equipment and systems. The Commissioning Agent will schedule Systems Functional Performance Tests with the Contractor and VA. The Commissioning Agent will witness and document the Systems Functional Performance Testing of systems. The Contractor shall execute the tests in accordance with the Systems Functional Performance Test Procedure.

J. Testing Prerequisites: In general, Systems Functional Performance Testing will be conducted only after Pre-Functional Checklists have been satisfactorily completed. The control system shall be sufficiently tested and approved by the Commissioning Agent and the VA before it is used to verify performance of other components or systems. The air balancing and water balancing shall be completed before Systems

Functional Performance Testing of air-related or water-related equipment or systems are scheduled. Systems Functional Performance Testing will proceed from components to subsystems to systems. When the proper performance of all interacting individual systems has been achieved, the interface or coordinated responses between systems will be checked.

K. Problem Solving: The Commissioning Agent will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the Contractor.

3.7 DOCUMENTATION, NONCONFORMANCE AND APPROVAL OF TESTS

A. Documentation: The Commissioning Agent will witness, and document the results of all Systems Functional Performance Tests using the specific procedural forms developed by the Commissioning Agent for that purpose. Prior to testing, the Commissioning Agent will provide these forms to the VA and the Contractor for review and approval. The Contractor shall include the filled out forms with the O&M manual data.

B. Nonconformance: The Commissioning Agent will record the results of the Systems Functional Performance Tests on the procedure or test form. All items of nonconformance issues will be noted and reported to the VA on Commissioning Field Reports and/or the Commissioning Master Issues Log.

1. Corrections of minor items of noncompliance identified may be made during the tests. In such cases, the item of noncompliance and resolution shall be documented on the Systems Functional Test Procedure.
2. Every effort shall be made to expedite the systems functional Performance Testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the Commissioning Agent shall not be pressured into overlooking noncompliant work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so by direction from the VA.
3. As the Systems Functional Performance Tests progresses and an item of noncompliance is identified, the Commissioning Agent shall discuss the issue with the Contractor and the VA.

4. When there is no dispute on an item of noncompliance, and the Contractor accepts responsibility to correct it:
   a. The Commissioning Agent will document the item of noncompliance and the Contractor's response and/or intentions. The Systems Functional Performance Test then continues or proceeds to another test or sequence. After the day's work is complete, the Commissioning Agent will submit a Commissioning Field Report to the VA. The Commissioning Agent will also note items of noncompliance and the Contractor’s response in the Master Commissioning Issues Log. The Contractor shall correct the item of noncompliance and report completion to the VA and the Commissioning Agent.
   b. The need for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test and the test shall be repeated.
5. If there is a dispute about item of noncompliance, regarding whether it is an item of noncompliance, or who is responsible:
   a. The item of noncompliance shall be documented on the test form with the Contractor's response. The item of noncompliance with the Contractor’s response shall also be reported on a Commissioning Field Report and on the Master Commissioning Issues Log.
   b. Resolutions shall be made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive and acceptance authority is with the Department of Veterans Affairs.
   c. The Commissioning Agent will document the resolution process.
   d. Once the interpretation and resolution have been decided, the Contractor shall correct the item of noncompliance, report it to the Commissioning Agent. The requirement for retesting will be determined by the Commissioning Agent. If retesting is required, the Commissioning Agent and the Contractor shall reschedule the test. Retesting shall be repeated until satisfactory performance is achieved.

C. Cost of Retesting: The cost to retest a System Functional Performance Test shall be solely the responsibility of the Contractor. Any required retesting by the Contractor shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.

D. Failure Due to Manufacturer Defect: If 10%, or three, whichever is greater, of identical pieces (size alone does not constitute a difference) of equipment fail to perform in compliance with the Contract Documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specifications, all identical units may be considered unacceptable by the VA. In such case, the Contractor shall provide the VA with the following:
   1. Within one week of notification from the VA, the Contractor shall examine all other identical units making a record of the findings. The findings shall be provided to the VA within two weeks of the original notice.
   2. Within two weeks of the original notification, the Contractor shall provide a signed and dated, written explanation of the problem, cause of failures, etc. and all proposed solutions which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
   3. The VA shall determine whether a replacement of all identical units or a repair is acceptable.
   4. Two examples of the proposed solution shall be installed by the Contractor and the VA shall be allowed to test the installations for up to one week, upon which the VA will decide whether to accept the solution.
   5. Upon acceptance, the Contractor shall replace or repair all identical items, at their expense and extend the warranty

accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

E. Approval: The Commissioning Agent will note each satisfactorily demonstrated function on the test form. Formal approval of the Systems Functional Performance Test shall be made later after review by the Commissioning Agent and by the VA. The Commissioning Agent will evaluate each test and report to the VA using a standard form. The VA will give final approval on each test using the same form, and provide signed copies to the Commissioning Agent and the Contractor.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Systems Functional Performance Tests: If any Systems Functional Performance Test cannot be completed due to the building structure, required occupancy condition or other conditions, execution of the Systems Functional Performance Testing may be delayed upon approval of the VA. These Systems Functional Performance Tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of the Contractor to conduct these unforeseen Deferred Systems Functional Performance Tests shall be negotiated between the VA and the Contractor.

B. Deferred Seasonal Testing: Deferred Seasonal Systems Functional Performance Tests are those that must be deferred until weather conditions are closer to the systems design parameters. The Commissioning Agent will review systems parameters and recommend which Systems Functional Performance Tests should be deferred until weather conditions more closely match systems parameters. The Contractor shall review and comment on the proposed schedule for Deferred Seasonal Testing. The VA will review and approve the schedule for Deferred Seasonal Testing. Deferred Seasonal Systems Functional Performances Tests shall be witnessed and documented by the Commissioning Agent. Deferred Seasonal Systems Functional Performance Tests shall be executed by the Contractor in accordance with these specifications.

3.9 OPERATION AND MAINTENANCE TRAINING REQUIREMENTS

A. Training Preparation Conference: Before operation and maintenance training, the Commissioning Agent will convene a training preparation

conference to include VA's COR, VA's Operations and Maintenance personnel, and the Contractor. The purpose of this conference will be to discuss and plan for Training and Demonstration of VA Operations and Maintenance personnel.

B. The Contractor shall provide training and demonstration as required by other Division 21, Division 22, Division 23, Division 26, Division 27, Division 28, and Division 31 sections. The Training and Demonstration shall include, but is not limited to, the following:
   1. Review the Contract Documents.
   2. Review installed systems, subsystems, and equipment.
   3. Review instructor qualifications.
   4. Review instructional methods and procedures.
   5. Review training module outlines and contents.
   6. Review course materials (including operation and maintenance manuals).
   7. Review and discuss locations and other facilities required for instruction.
   8. Review and finalize training schedule and verify availability of educational materials, instructors, audiovisual equipment, and facilities needed to avoid delays.
   9. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

C. Training Module Submittals: The Contractor shall submit the following information to the VA and the Commissioning Agent:
   1. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module. At completion of training, submit two complete training manuals for VA's use.
   2. Qualification Data: Submit qualifications for facilitator and/or instructor.
   3. Attendance Record: For each training module, submit list of participants and length of instruction time.

4. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
5. Demonstration and Training Recording:
   a. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
   b. Video Format: Provide high quality color DVD color on standard size DVD disks.
   c. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
   d. Narration: Describe scenes on video recording by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   e. Submit two copies within seven days of end of each training module.
6. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding videotape. Include name of Project and date of videotape on each page.

D. Quality Assurance:
1. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
2. Instructor Qualifications: A factory authorized service representative, complying with requirements in Division 01

Section "Quality Requirements," experienced in operation and maintenance procedures and training.

3. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.

E. Training Coordination:

1. Coordinate instruction schedule with VA's operations. Adjust schedule as required to minimize disrupting VA's operations.
2. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
3. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by the VA.

F. Instruction Program:

1. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
   a. Fire protection systems, including fire alarm, fire pumps, and fire suppression systems.
   b. Intrusion detection systems.
   c. Conveying systems, including elevators, wheelchair lifts, escalators, and automated materials handling systems.
   d. Medical equipment, including medical gas equipment and piping.
   e. Laboratory equipment, including laboratory air and vacuum equipment and piping.
   f. Heat generation, including boilers, feedwater equipment, pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers, and heating hot water distribution piping.
   g. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
   h. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
   i. HVAC instrumentation and controls.

j. Electrical service and distribution, including switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
k. Packaged engine generators, including synchronizing switchgear/switchboards, and transfer switches.
l. Lighting equipment and controls.
m. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass evacuation, voice and data, and entertainment television equipment.
n. Site utilities including lift stations, condensate pumping and return systems, and storm water pumping systems.

G. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participants are expected to master. For each module, include instruction for the following:
1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
a. System, subsystem, and equipment descriptions.
b. Performance and design criteria if Contractor is delegated design responsibility.
c. Operating standards.
d. Regulatory requirements.
e. Equipment function.
f. Operating characteristics.
g. Limiting conditions.
H, Performance curves.
2. Documentation: Review the following items in detail:
a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project Record Documents.
e. Identification systems.
f. Warranties and bonds.

g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.
4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.
5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.
7. Maintenance: Include the following:
   a. Inspection procedures.

b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

H. Training Execution:
1. Preparation: Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual. Set up instructional equipment at instruction location.
2. Instruction:
   a. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Department of Veterans Affairs for number of participants, instruction times, and location.
   b. Instructor: Engage qualified instructors to instruct VA's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
      1) The Commissioning Agent will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
      2) The VA will furnish an instructor to describe VA's operational philosophy.
      3) The VA will furnish the Contractor with names and positions of participants.

3. Scheduling: Provide instruction at mutually agreed times. For equipment that requires seasonal operation, provide similar instruction at start of each season. Schedule training with the VA and the Commissioning Agent with at least seven days' advance notice.
4. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral, or a written, performance-based test.
5. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

I. Demonstration and Training Recording:

1. General: Engage a qualified commercial photographer to record demonstration and training. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice. At beginning of each training module, record each chart containing learning objective and lesson outline.
2. Video Format: Provide high quality color DVD color on standard size DVD disks.
3. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
4. Narration: Describe scenes on videotape by audio narration by microphone while demonstration and training is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

----- END -----

DIVISION 02
EXISTING CONDITIONS

08-01-17

SECTION 02 41 00
DEMOLITION

PART 1 - GENERAL

1.1 DESCRIPTION:

This section specifies demolition and removal of buildings, portions of buildings, utilities, other structures and debris from trash dumps shown.

1.2 RELATED WORK:

B. Safety Requirements: Section 01 35 26 Safety Requirements Article, ACCIDENT PREVENTION PLAN (APP).

C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.

D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.

E. Asbestos Removal: Section 02 82 11, TRADITIONAL ASBESTOS ABATEMENT.

F. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

G. Construction Waste Management: Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT.

H. Infectious Control: Section 01 35 26, SAFETY REQUIREMENTS.

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.

C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.

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. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
   3. 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.
   4. 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 site 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’s 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's Representative 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 and Section 01 35 26, SAFETY REQUIREMENTS.

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 buildings and structures, including all appurtenances related or connected thereto, as noted below:
   1. As required for installation of new utility service lines.
   2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.

B. Debris, including brick, concrete, stone, 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's Representative. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.

C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.

D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. 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. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500mm (5feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.

E. 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's Representative. When Utility lines are encountered that are not indicated on the drawings, the Contracting Officer's 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's 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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01-01-21

NFPA
SECTION 02 82 11
TRADITIONAL ASBESTOS ABATEMENT

PART 1 - GENERAL

1.1 SUMMARY OF THE WORK

A. Contract Documents and Related Requirements: Drawings, general provisions of the contract, including general and supplementary conditions and other Division 01 specifications, shall apply to the work of this section. The contract documents show or describe the work to be done under the contract and related requirements and conditions impacting the project. Related requirements and conditions include applicable codes and regulations, notices and permits, existing site conditions and restrictions on use of the site, requirements for partial owner occupancy during the work, coordination with other work and the phasing of the work. In the event the Asbestos Abatement Contractor discovers a conflict in the contract documents and/or requirements or codes, the conflict must be brought to the immediate attention of the Contracting Officer for resolution. Whenever there is a conflict or overlap in the requirements, the most stringent shall apply. Any actions taken by the Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Asbestos Abatement Contractor. All costs incurred due to such action are also the responsibility of the Asbestos Abatement Contractor.

B. Extent of Work:

1. Below is a brief description of the estimated quantities of asbestos containing materials to be abated. These quantities are for informational purposes only and are based on the best information available at the time of the specification preparation. The Contractor shall satisfy themselves of the actual quantities to be abated. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.
2. Removal, clean-up and disposal of asbestos containing materials (ACM) and asbestos/waste contaminated elements or debris in an appropriate regulated area for the following approximate quantities;

( ) linear meters (feet) of <50 mm (2 inches) diameter pipe insulation.

( ) linear meters (feet) of 50 - 150 mm (2 inches - 6 inches) diameter pipe insulation.

( ) linear meters (feet) of >150 mm (6 inches) diameter pipe insulation.

( ) fittings (including saddle blocks) 50 - 150 mm (2 inches - 6 inches) in diameter.

( ) square meters (feet) of boiler/tank insulation.

( ) square meters (feet) of duct insulation.

( ) square meters (feet) of plaster ceiling/wall.

( ) square meters (feet) of drywall and/or drywall joint compound.

( ) square meters (feet) of sprayed or troweled on surfacing . materials

( ) square meters (feet) of miscellaneous material.

( ) cubic meters (feet) of contaminated soil/materials.

( ) other specify

3. Encapsulation of ACM in the following quantities
4. Enclosure of ACM in the following quantities

C. Related Work:

1. Section 07 84 00, FIRESTOPPING
2. Section 02 41 00, DEMOLITION
3. Division 09, FINISHES
4. Division 22, PLUMBING
5. Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING
6. Section 22 05 23, GENERAL-DUTY VALVES FOR PLUMBING PIPING
7. Section 22 11 00, FACILITY WATER DISTRIBUTION
8. Section 22 13 00, FACILITY SANITARY AND VENT PIPING SEWERAGE
9. Section 23 05 11, COMMON WORK RESULTS FOR HVAC
10. Section 22 14 00, FACILITY STORM DRAINAGE
11. Section 23 07 11, HVAC AND BOILER PLANT INSULATION
12. Section 23 21 13, HYDRONIC PIPING
13. Section 23 22 13, STEAM AND CONDENSATE HEATING PIPING
14. Section 23 31 00, HVAC DUCTS AND CASINGS
15. Section 23 37 00, AIR OUTLETS AND INLETS

D. Tasks:

1. The work tasks are summarized briefly as follows:
   a. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, regulated area preparations, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.
   b. Abatement activities including removal, encapsulation , enclosure, clean-up and disposal of ACM waste, recordkeeping, security, monitoring, and inspections.
   c. Cleaning and decontamination activities including final visual inspection, air monitoring and certification of decontamination.

E. Contractors Use of Premises:

2. The Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Contractor shall perform the work in accordance with the VA specifications, drawings, phasing plan and in compliance with any/all applicable Federal, State and Local regulations and requirements.
3. The Contractor shall use the existing facilities in the building strictly within the limits indicated in contract documents as well as the approved VA Design and Construction Procedures. VA Design and Construction Procedures drawings of partially occupied buildings will show the limits of regulated areas; the placement of decontamination facilities; the temporary location of bagged waste ACM; the path of transport to outside the building; and the temporary waste storage area for each building/regulated area. Any variation from the arrangements shown on drawings shall be secured in writing from the VA representative through the pre-abatement plan of action. The following limitations of use shall apply to existing facilities shown on drawings:

1.2 VARIATIONS IN QUANTITY

A. The quantities and locations of ACM as indicated on the drawings and the extent of work included in this section are estimated which are limited by the physical constraints imposed by occupancy of the buildings and accessibility to ACM. Accordingly, minor variations (+/- 10 percent) in quantities of ACM within the regulated area are

considered as having no impact on contract price and time requirements of this contract. Where additional work is required beyond the above variation, the contractor shall provide unit prices for newly discovered ACM and those prices shall be used for additional work required under the contractor.

1.3 STOP ASBESTOS REMOVAL

A. If the Contracting Officer; their field representative; the facility Safety Officer/Manager or their designee, or the VA Professional Industrial Hygienist/Certified Industrial Hygienist (VPIH/CIH) presents a verbal **Stop Asbestos Removal Order**, the Contractor/Personnel shall immediately stop all asbestos removal and maintain HEPA filtered negative pressure air flow in the containment and adequately wet any exposed ACM. If a verbal Stop Asbestos Removal Order is issued, the VA shall follow-up with a written order to the Contractor as soon as it is practicable. The Contractor shall not resume any asbestos removal activity until authorized to do so in writing by the VA Contracting Officer. A stop asbestos removal order may be issued at any time the VA Contracting Officer determines abatement conditions/activities are not within VA specification, regulatory requirements or that an imminent hazard exists to human health or the environment. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA. Standby time and costs for corrective actions will be borne by the Contractor, including the VPIH/CIH time. The occurrence of any of the following events shall be reported immediately by the Contractor's competent person to the VA Contracting Office or field representative using the most expeditious means (e.g., verbal or telephonic), followed up with written notification to the Contracting Officer as soon as practical. The Contractor shall immediately stop asbestos removal/disturbance activities and initiate fiber reduction activities if:

4. Airborne PCM analysis results equal to or greater than 0.01 f/cc above background levels inside the building but outside the regulated area;
5. breach or break in regulated area containment barrier(s);
6. less than –0.02 inch WCG pressure in the regulated area;

7. serious injury/death at the site;
8. fire/safety emergency at the site;
9. respiratory protection system failure;
10. power failure or loss or inadequate use of wetting agent;
11. any visible emissions observed outside the regulated area; or
12. failure to follow project specification requirements.

1.4 DEFINITIONS

A. General: Definitions and explanations here are neither complete nor exclusive of all terms used in the contract documents, but are general for the work to the extent they are not stated more explicitly in another element of the contract documents. Drawings must be recognized as diagrammatic in nature and not completely descriptive of the requirements indicated therein.

B. Glossary:

Abatement - Procedures to control fiber release from asbestos-containing materials. Includes removal, encapsulation, enclosure, demolition, and renovation activities related to asbestos containing materials (ACM).

Adequately wet - Sufficiently mixed or penetrated with liquid to prevent the release of particulates. If visible emissions are observed coming from the ACM, then that material has not been adequately wetted.

Aerosol - Solid or liquid particulate suspended in air.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive air sampling - EPA AHERA defined clearance sampling method using air moving equipment such as fans and leaf blowers to aggressively disturb and maintain in the air residual fibers after abatement.

AHERA - Asbestos Hazard Emergency Response Act. Asbestos regulations for schools issued in 1987.

Aircell - Pipe or duct insulation made of corrugated cardboard which contains asbestos.

Air monitoring - The process of measuring the fiber content of a known volume of air collected over a specified period of time. The NIOSH 7400 Method, Issue 3, Fifth Edition is used to determine the fiber levels in

air. For personal samples, area air samples and clearance air testing using Phase Contrast Microscopy (PCM) analysis, the NIOSH Method 7402 (Issue 2, Fourth Edition) can be used when it is necessary to confirm fibers counted by PCM as being asbestos. The AHERA TEM analysis may be used for background, area samples and clearance samples when required by this specification, or at the discretion of the VPIH/CIH as appropriate.

Air sample filter - The filter used to collect fibers which are then counted. The filter is made of mixed cellulose ester (MCE) membrane for PCM (Phase Contrast Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.8 micron pore size) and MCE for TEM (Transmission Electron Microscopy, 25 mm, 3-piece with 2 inches Static Extension Cowl, 0.45 micron pore size).

Amended water - Water to which a surfactant (wetting agent) has been added to increase the penetrating ability of the liquid.

Asbestos - Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated or altered. Asbestos also includes PACM, as defined below.

Asbestos Hazard Abatement Plan (AHAP) - Asbestos work procedures required to be submitted by the contractor before work begins.

Asbestos-containing material (ACM) - Any material containing more than one percent of asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-contaminated soil (ACS) – Soil found in the work area or in adjacent areas such as crawlspaces or pipe tunnels which is contaminated with asbestos-containing material debris and cannot be easily separated from the material.

Asbestos-containing waste (ACW) material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

Asbestos Project Monitor – Some states require that any person conducting asbestos abatement air sampling, clearance inspections and clearance air sampling be licensed as an asbestos project monitor.

Asbestos waste decontamination facility - A system consisting of drum/bag washing facilities and a temporary storage area for cleaned containers of asbestos waste. Used as the exit for waste and equipment leaving the regulated area. In an emergency, it may be used to evacuate personnel.

Authorized person - Any person authorized by the VA, the Contractor, or government agency and required by work duties to be present in regulated areas.

Authorized visitor - Any person approved by the VA; the contractor; or any government agency representative having jurisdiction over the regulated area (e.g., OSHA, Federal and State EPA).

Barrier - Any surface that isolates the regulated area and inhibits fiber migration from the regulated area.

Containment Barrier - An airtight barrier consisting of walls, floors, and/or ceilings of sealed plastic sheeting which surrounds and seals the outer perimeter of the regulated area.

Critical Barrier - The barrier responsible for isolating the regulated area from adjacent spaces, typically constructed of 2-layers of 6-mil independently installed plastic sheeting (Polyethylene) secured in place at openings such as doors, windows, penetrations or any other opening into the regulated area.

Primary Barrier – Plastic barriers placed over critical barriers and exposed directly to abatement work or to secondary barrier.

Secondary Barrier - Any additional plastic barriers used to isolate and provide protection from debris during abatement work.

Breathing zone - The hemisphere forward of the shoulders with a radius of about 150 - 225 mm (6 - 9 inches) from the worker's nose.

Bridging encapsulant - An encapsulant that forms a layer on the surface of the ACM.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and recordkeeping functions relating to a building and/or facility in which asbestos activities take place.

Bulk testing - The collection and analysis of suspect asbestos containing materials.

Certified Industrial Hygienist (CIH) - A person certified in the comprehensive practice of industrial hygiene by the American Board of Industrial Hygiene.

Class I asbestos work - Activities involving the removal of Thermal System Insulation (TSI) and surfacing ACM and Presumed Asbestos Containing Material (PACM).

Class II asbestos work - Activities involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos-containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic.

Clean room/Changing room - An uncontaminated room having facilities for the storage of employee's street clothing and uncontaminated materials and equipment.

Clearance sample - The final air sample taken after all asbestos work has been done and visually inspected. Performed by the VA's professional industrial hygiene consultant/Certified Industrial Hygienist (VPIH/CIH).

Closely resemble - The major workplace conditions which have contributed to the levels of historic asbestos exposure, are no more protective than conditions of the current workplace.

Competent person - In addition to the definition in 29 CFR 1926.32(f), one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f); in addition, for Class I and II work who is specially trained in a training course which meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contractor's Professional Industrial Hygienist (CPIH/CIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of a PIH and may report to a certified industrial hygienist (CIH).

Count - Refers to the fiber count or the average number of fibers greater than five microns in length with a length-to-width (aspect) ratio of at least 3 to 1, per cubic centimeter of air.

Crawlspace – An area which can be found either in or adjacent to the work area. This area has limited access and egress and may contain asbestos materials and/or asbestos contaminated soil.

Decontamination area/unit - An enclosed area adjacent to and connected to the regulated area and consisting of an equipment room, shower room, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

Demolition - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

Disposal bag - Typically 6-mil thick sift-proof, dustproof, leak-tight container used to package and transport asbestos waste from regulated areas to the approved landfill. Each bag/container must be labeled/marked in accordance with EPA, OSHA and DOT requirements.

Disturbance – Asbestos Operations and Maintenance Activities (OSHA Class III) that disrupt the matrix of ACM or PACM, crumble or pulverize ACM or PACM, or generate visible debris from ACM or PACM. Disturbance includes cutting away small amounts of ACM or PACM, no greater than the amount that can be contained in one standard sized glove bag or waste bag in order to access a building component. In no event shall the amount of ACM or PACM so disturbed exceed that which can be contained in one glove bag or disposal bag, which shall not exceed 60 inches in length or width.

Drum - A rigid, impermeable container made of cardboard fiber, plastic, or metal which can be sealed in order to be sift-proof, dustproof, and leak-tight.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

Encapsulant - A material that surrounds or embeds asbestos fibers in an adhesive matrix and prevents the release of fibers.

Encapsulation - Treating ACM with an encapsulant.

Enclosure - The construction of an air tight, impermeable, permanent barrier around ACM to control the release of asbestos fibers from the material and also eliminate access to the material.

Equipment room - A contaminated room located within the decontamination area that is supplied with impermeable bags or containers for the disposal of contaminated protective clothing and equipment.

Fiber - A particulate form of asbestos, 5 microns or longer, with a length to width (aspect) ratio of at least 3 to 1.

Fibers per cubic centimeter (f/cc) - Abbreviation for fibers per cubic centimeter, used to describe the level of asbestos fibers in air.

Filter - Media used in respirators, vacuums, or other machines to remove particulate from air.

Firestopping - Material used to close the open parts of a structure in order to prevent a fire from spreading.

Friable asbestos containing material - Any material containing more than one (1) percent asbestos as determined using the method specified in 40 CFR 763, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

Glovebag - Not more than a 60 x 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which materials and tools may be handled.

High efficiency particulate air (HEPA) filter – An ASHRAE MERV 17 filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

HEPA vacuum - Vacuum collection equipment equipped with a HEPA filter system capable of collecting and retaining asbestos fibers.

Homogeneous area - An area of surfacing, thermal system insulation or miscellaneous ACM that is uniform in color, texture and date of application.

HVAC - Heating, Ventilation and Air Conditioning

Industrial hygienist (IH) - A professional qualified by education, training, and experience to anticipate, recognize, evaluate and develop controls for occupational health hazards. Meets definition requirements of the American Industrial Hygiene Association (AIHA).

Industrial hygienist technician (IH Technician) - A person working under the direction of an IH or CIH who has special training, experience, certifications and licenses required for the industrial hygiene work assigned. Some states require that an industrial hygienist technician conducting asbestos abatement air sampling, clearance

inspection and clearance air sampling be licensed as an asbestos project monitor.

Intact - The ACM has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix.

Lockdown - Applying encapsulant, after a final visual inspection, on all abated surfaces at the conclusion of ACM removal prior to removal of critical barriers.

National Emission Standards for Hazardous Air Pollutants (NESHAP) - EPA's rule to control emissions of asbestos to the environment (40 CFR part 61, Subpart M).

Negative initial exposure assessment - A demonstration by the employer which complies with the criteria in 29 CFR 1926.1101 (f)(2)(iii), that employee exposure during an operation is expected to be consistently below the PEL or Excursion Limit (EL).

Negative pressure - Air pressure which is lower than the surrounding area, created by exhausting air from a sealed regulated area through HEPA equipped filtration units. OSHA requires maintaining -0.02 inch water column gauge inside the negative pressure enclosure.

Negative pressure respirator - A respirator in which the air pressure inside the facepiece is negative during inhalation relative to the air pressure outside the respirator facepiece.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

Organic vapor cartridge - The type of cartridge used on air purifying respirators to remove organic vapor hazardous air contaminants.

Outside air - The air outside buildings and structures, including, but not limited to, the air under a bridge or in an open ferry dock.

Owner/operator - Any person who owns, leases, operates, controls, or supervises the facility being demolished or renovated or any person who owns, leases, operates, controls, or supervises the demolition or renovation operation, or both.

Penetrating encapsulant - Encapsulant that is absorbed into the ACM matrix without leaving a surface layer.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for as an eight (8) hour time-weighted average (TWA). For asbestos fibers, the eight (8) hour time-weighted average PEL is 0.1 fibers per cubic centimeter (0.1 f/cc) of air and the 30-minute Excursion Limit (EL) is 1.0 fibers per cubic centimeter (1 f/cc).

Personal protective equipment (PPE) – equipment designed to protect user from injury and/or specific job hazard. Such equipment may include protective clothing, hard hats, safety glasses, fall protection, and respirators.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone for one or more workers within the regulated area using a filter cassette and a calibrated air sampling pump to determine asbestos exposure.

Pipe tunnel – An area, typically located adjacent to mechanical spaces or boiler rooms in which the pipes servicing the heating system in the building are routed to allow the pipes to access heating elements. These areas may contain asbestos pipe insulation, asbestos fittings, debris or asbestos-contaminated soil.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6-mils thick, semi-transparent, flame retardant per NFPA 241.

Positive/negative fit check - A method of verifying the seal of a facepiece respirator by temporarily occluding the filters and breathing in (inhaling) and then temporarily occluding the exhalation valve and breathing out (exhaling) while checking for inward or outward leakage of the respirator, respectively.

Presumed ACM (PACM) - Thermal system insulation, surfacing, and flooring material installed in buildings prior to 1981. If the building owner has actual knowledge, or should have known through the exercise of due diligence that other materials are ACM, they too must be treated as PACM. The designation of PACM may be rebutted pursuant to 29 CFR 1926.1101 (k)(5).

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Competent Person" at 29

CFR 1926.1101 (b); has completed two specialized EPA approved courses on management and supervision of asbestos abatement projects; has formal training in respiratory protection and waste disposal; and has a minimum of four projects of similar complexity with this project of which at least three projects serving as the supervisory IH. The PIH may be either the VA's PIH (VPIH/CIH) or Contractor's PIH (CPIH/CIH).

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Subpart E, Appendix C, Part I; (B)(5).

Assigned protection factor - A value assigned by OSHA/NIOSH to indicate the expected protection provided by each respirator class, when the respirator is properly selected and worn correctly. The number indicates the reduction of exposure level from outside to inside the respirator facepiece.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

Quantitative fit test (QNFT) - A fit test using a challenge material which is quantified outside and inside the respirator thus allowing the determination of the actual fit factor.

Regulated area - An area established by the employer to demarcate where Class I, II, III asbestos work is conducted, and any adjoining area where debris and waste from such asbestos work may accumulate; and a work area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed the PEL.

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

Removal - All operations where ACM, PACM and/or RACM is taken out or stripped from structures or substrates, including demolition operations.

Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of asbestos from a facility component which does not involve demolition activity.

Repair - Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM or PACM attached to structures or substrates.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area.

Supplied air respirator (SAR) - A respiratory protection system that supplies minimum Grade D respirable air per ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-2018.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, decorative, fireproofing and other purposes.

Surfactant - A chemical added to water to decrease water's surface tension thus making it more penetrating into ACM.

Thermal system ACM - A material containing more than 1 percent asbestos applied to pipes, fittings, boilers, breeching, tanks, ducts, or other structural components to prevent heat loss or gain.

Transmission electron microscopy (TEM) - A microscopy method that can identify and count asbestos fibers.

VA Professional Industrial Hygienist (VPIH/CIH) – The Department of Veterans Affairs Professional Industrial Hygienist must meet the qualifications of a PIH, and may report to a Certified Industrial Hygienist (CIH).

VA Representative - The VA official responsible for on-going project work.

VA Total – means a building or substantial part of the building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM/ACS or ACM waste material.

Waste/Equipment decontamination facility (W/EDF) – The area in which equipment is decontaminated before removal from the regulated area.

Waste generator - Any owner or operator whose act or process produces asbestos-containing waste material.

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

Wet cleaning - The process of thoroughly eliminating, by wet methods, any asbestos contamination from surfaces or objects.

C. Referenced Standards Organizations: See Section 01 42 19 REFERENCED STANDARDS.

1.5 APPLICABLE CODES AND REGULATIONS

A. General Applicability of Codes, Regulations, and Standards:

1. All work under this contract shall be done in strict accordance with all applicable Federal, State, and Local regulations, standards and codes governing asbestos abatement, and any other trade work done in conjunction with the abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification.
2. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specifications exists, the most stringent requirement(s) shall be utilized.
3. Copies of all standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 shall be available at the worksite in the clean change area of the worker decontamination system and/or the Contractor’s on-site Field Office. These standards, regulations, codes and other applicable documents, including this specification and those listed in Section 1.5 may be made available electronically.

B. Asbestos Abatement Contractor Responsibility: The Asbestos Abatement Contractor (Contractor) shall assume full responsibility and liability for compliance with all applicable Federal, State and Local regulations related to any and all aspects of the asbestos abatement project. The Contractor is responsible for providing and maintaining training, accreditations, medical exams, medical records, personal protective equipment (PPE), respiratory protection, and respirator fit testing, as required by applicable Federal, State and Local regulations. The

Contractor shall hold the VA and VPIH/CIH consultants harmless for any Contractor's failure to comply with any applicable work, packaging, transporting, disposal, safety, health, or environmental requirement on the part of himself, his employees, or his subcontractors. The Contractor will incur all costs of the CPIH/CIH, including all sampling/analytical costs to assure compliance with OSHA/EPA/State/Local requirements related to failure to comply with the regulations applicable to the work.

C. Federal Requirements:

1. Federal requirements which govern asbestos abatement include, but are not limited to, the following regulations:
   a. Occupational Safety and Health Administration **(OSHA)**
      1) Title 29 CFR 1926.1101 - Construction Standard for Asbestos
      2) Title 29 CFR 1926 Subpart E - Personal Protective Equipment and Life Saving Equipment
      3) Title 29 CFR 1910.134 - Respiratory Protection
      4) Title 29 CFR 1926 - Construction Industry Standards
      5) Title 29 CFR 1926.33 - Access to Employee Exposure and Medical Records
      6) Title 29 CFR 1926.59 same as 1910.1200 - Hazard Communication
      7) Title 29 CFR 1926 Subpart C – General Safety and Health Provisions and Subpart D – Occupational Health and Environmental Controls
   b. Environmental Protection Agency **(EPA):**
      1) 40 CFR 61 Subpart M - National Emission Standard for Hazardous Air Pollutants - Asbestos.
      2) 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos Hazard Abatement Reauthorization Act (ASHARA)
   c. Department of Transportation **(DOT)**
      1) Title 49 CFR 171 - 180 – Transportation

D. State Requirements:

1. State requirements that apply to the asbestos abatement work, disposal, clearance, etc., include, but are not limited to, the following:

E. Local Requirements:

1. If local requirements are more stringent than federal or state standards, the local standards are to be followed.

F. Standards:
   1. Standards which govern asbestos abatement activities include, but are not limited to, the following:
      a. American National Standards Institute (ANSI)/ASSP Z9.2-2018 - Fundamentals Governing the Design and Operation of Local Exhaust Systems and ANSI/ASSE Z88.2-2015 - Practices for Respiratory Protection.
      b. Underwriters Laboratories (UL) 586-2009 - UL Standard for Safety of HEPA Filter Units, 9th Edition; ANSI Approval 2017-12-19.
   2. Standards which govern encapsulation work include, but are not limited to the following:
      a. American Society for Testing and Materials International (ASTM)
   3. Standards which govern the fire and safety concerns in abatement work include, but are not limited to, the following:
      a. National Fire Protection Association (NFPA) 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations.
      b. NFPA 701 - Standard Methods for Fire Tests for Flame Resistant Textiles and Film.
      c. NFPA 101 - Life Safety Code

G. EPA Guidance Documents:
   1. EPA guidance documents which discuss asbestos abatement work activities are listed below. These documents are made part of this section by reference.
   2. Guidance for Controlling ACM in Buildings (Purple Book) EPA 560/5-85-024
   3. Asbestos Waste Management Guidance EPA 530-SW-85-007
   4. A Guide to Respiratory Protection for the Asbestos Abatement Industry EPA-560-OPTS-86-001
   5. Guide to Managing Asbestos in Place (Green Book) TS 799 20T July 1990

H. Notices:
   1. State and Local agencies: Send written notification as required by State and Local regulations prior to beginning any work on ACM as follows:

2. Copies of notifications shall be submitted to the VA for the facility's records in the same time frame notification are given to EPA, State, and Local authorities.

I. Permits/Licenses: The contractor shall apply for and have all required permits and licenses to perform asbestos abatement work as required by Federal, State, and Local regulations.

J. Posting and Filing of Regulations: Maintain two (2) copies of applicable Federal, State, and Local regulations. Post one copy of each in the clean room at the regulated area where workers will have daily access to the regulations and keep another hard copy or electronic copy in the Contractor's office.

K. VA Responsibilities prior to commencement of work:

1. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Arrangements must be made prior to starting work for relocation of desks, files, equipment, and personal possessions to avoid unauthorized access into the regulated area. **Note: Notification of adjacent personnel is required by OSHA in 29 CFR 1926.1101 (k) to prevent unnecessary or unauthorized access to the regulated area.**
2. Submit to the Contractor results of background air sampling; including location of samples, person who collected the samples, equipment utilized, calibration data and method of analysis. During abatement, submit to the Contractor, results of bulk material analysis and air sampling data collected during the course of the abatement. This information shall not release the Contractor from any responsibility for OSHA compliance.

L. Emergency Action Plan and Arrangements:

1. An Emergency Action Plan shall be developed prior to commencing abatement activities and shall be agreed to by the Contractor and the VA. The Plan shall meet the requirements of 29 CFR 1926, Subpart C, Standard 1926.35 Employee Emergency Action Plans.
2. Emergency procedures shall be in written form and prominently posted in the clean room and equipment room of the decontamination unit. Everyone, prior to entering the regulated area, must read and sign

these procedures to acknowledge understanding of the regulated area layout, location of emergency exits and emergency procedures.

3. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedule; layout of regulated area; and access to the regulated area, particularly barriers that may affect response capabilities.
4. Emergency planning shall include consideration of fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness. Written procedures for response to emergency situations shall be developed and employee training in procedures shall be provided.
5. Employees shall be trained in regulated area/site evacuation procedures in the event of workplace emergencies.
   a. For non-life-threatening situations - employees injured or otherwise incapacitated shall be decontaminated following normal procedures with assistance from fellow workers, if necessary, before exiting the regulated area to obtain proper medical treatment.
   b. For life-threatening injury or illness, worker decontamination shall take least priority after measures to stabilize the injured worker, medical personnel shall remove them from the regulated area if back or neck injury is present, and secure proper medical treatment.
6. Telephone numbers of any/all emergency response personnel shall be prominently posted in the clean room, along with the location of the nearest telephone.
7. The Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3-4 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel required to provide first aid/CPR.
8. The Emergency Action Plan shall provide for a Contingency Plan in the event that an incident occurs that may require the modification of the standard operating procedures during abatement. Such incidents include, but are not limited to, fire; accident; power

failure; negative pressure failure; and supplied air system failure. The Contractor shall detail procedures to be followed in the event of an incident assuring that asbestos abatement work is stopped and wetting is continued until correction of the problem.

M. Pre-Construction Meeting:

1. Prior to commencing the work, the Contractor shall meet with the VA Certified Industrial Hygienist (VPIH/CIH) to present and review, as appropriate, the items following this paragraph. The Contractor's Competent Person(s) who will be on-site shall participate in the pre-start meeting. The pre-start meeting is to discuss and determine procedures to be used during the project. At this meeting, the Contractor shall provide:

   a. Proof of Contractor licensing.
   b. Proof the Competent Person(s) is trained and accredited and approved for working in this State. Verification of the experience of the Competent Person(s) shall also be presented.
   c. A list of all workers who will participate in the project, including experience and verification of training and accreditation.
   d. A list of and verification of training for all personnel who have current first-aid/CPR training. A minimum of one person per shift must have adequate training.
   e. Current medical written opinions for all personnel working on-site meeting the requirements of 29 CFR 1926.1101 (m).
   f. Current fit-tests for all personnel wearing respirators on-site meeting the requirements of 29 CFR 1926.1101 (h) and Appendix C.
   g. A copy of the Contractor's Asbestos Hazard Abatement Plan. In these procedures, the following information must be detailed, specific for this project.
      1) Regulated area preparation procedures;
      2) Notification requirements procedure of Contractor as required in 29 CFR 1926.1101 (d) Multi-Employer Worksites;
      3) Decontamination area set-up/layout and decontamination procedures for employees;
      4) Abatement methods/procedures and equipment to be used;
      5) Personal protective equipment to be used.

h. At this meeting the Contractor shall provide all submittals as required.

i. Procedures for handling, packaging and disposal of asbestos waste.

j. Emergency Action Plan and Contingency Plan Procedures.

1.6 PROJECT COORDINATION

A. The following are the minimum administrative and supervisory personnel necessary for coordination of the work.

1. Personnel:

a. Administrative and supervisory personnel shall consist of a qualified Competent Person(s) as defined by OSHA in the Construction Standards and the Asbestos Construction Standard; Contractor Professional Industrial Hygienist and Industrial Hygiene Technicians. These employees are the Contractor's representatives responsible for compliance with these specifications and all other applicable requirements.

b. Non-supervisory personnel shall consist of an adequate number of qualified personnel to meet the schedule requirements of the project. Personnel shall meet required qualifications. Personnel utilized on-site shall be pre-approved by the VA representative. A request for approval shall be submitted for any person to be employed during the project giving the person's name; last four digits of social security number; qualifications; accreditation card with color picture, if required by state; Certificate of Worker's Acknowledgment; and Affidavit of Medical Surveillance and Respiratory Protection and current Respirator Fit Test.

c. Minimum qualifications for Contractor and assigned personnel are:

1) The Contractor has conducted within the last three (3) years, three (3) projects of similar complexity and dollar value as this project; has not been cited and penalized for serious violations of Federal (and State or Local as applicable) EPA and OSHA asbestos regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work as required by the state; is licensed in applicable state; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for

asbestos work; has adequate materials, equipment and supplies to perform the work.

2) The Competent Person has four (4) years of abatement experience of which two (2) years were as the Competent Person on the project; meets the OSHA definition of a Competent Person; has been the Competent Person on two (2) projects of similar size and complexity as this project within the past three (3) years; has completed EPA AHERA/OSHA/State/Local training requirements/accreditation(s) and refreshers; and has all required OSHA documentation related to medical and respiratory protection.

3) The Contractor Professional Industrial Hygienist/CIH (CPIH/CIH) shall have five (5) years of monitoring experience and supervision of asbestos abatement projects; has participated as senior IH on five (5) abatement projects, three (3) of which are similar in size and complexity as this project; has specialized EPA AHERA/OSHA training in asbestos abatement management, respiratory protection, waste disposal and asbestos inspection; has completed the NIOSH 582 Course or equivalent, Contractor/Supervisor course; and has appropriate medical/respiratory protection records/documentation.

4) The Abatement Personnel shall have completed the EPA AHERA/OSHA abatement worker course; have training on the standard operating procedures of the Contractor; has one year of asbestos abatement experience within the past three (3) years of similar size and complexity; has applicable medical and respiratory protection documentation; has certificate of training/current refresher and State accreditation/license.

d. All personnel shall be in compliance with OSHA construction safety training as applicable and submit certification.

1.7 RESPIRATORY PROTECTION

A. General - Respiratory Protection Program: The Contractor shall develop and implement a written Respiratory Protection Program (RPP) which is in compliance with OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.134. ANSI Standard Z88.2-2015 provides excellent guidance for

developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written RPP shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c) - Respiratory Protection Program.

B. Respiratory Protection Program Coordinator: The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years of experience coordinating RPP of similar size and complexity. The RPPC must submit a signed statement attesting to the fact that the program meets the above requirements.

C. Selection and Use of Respirators: The procedure for the selection and use of respirators must be submitted to the VA as part of the Contractor's qualifications. The procedure must be written clearly enough for workers to understand. A copy of the Respiratory Protection Program must be available in the clean room of the decontamination unit or in the onsite Contractor’s office, for reference by employees or authorized visitors.

D. Minimum Respiratory Protection: Shall be a ½-mask negative pressure air purifying respirator equipped with P100 filters, provided personal air samples in the workplace remain at or below 0.1 f/cc, determined as an 8-hour TWA. Full face powered air purifying respirator equipped with P100 filters shall be required until Contractor demonstrates that personal air samples are at or below 0.1 f/cc, determined as an 8-hour TWA. A higher level of respiratory protection shall be required, if fiber levels exceed 1 f/cc as an 8-hour TWA, inside the regulated work area. Respirator selection shall meet the requirements of 29 CFR 1926.1101 (h) and 29 CFR 1910.134 (d)(3)(i)(A) Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

E. Medical Written Opinion: No employee shall be allowed to wear a respirator unless a physician or other licensed health care professional has provided a written determination they are medically qualified to wear the class of respirator to be used on the project while wearing whole body impermeable garments and subjected to heat or cold stress.

F. Respirator Fit Test: All personnel wearing respirators shall have a current qualitative/quantitative fit test which was conducted in

accordance with 29 CFR 1910.134 (f) and Appendix A. Quantitative fit tests shall be done for PAPRs which have been put into a motor/blower failure mode.

G. Respirator Fit Check: The Competent Person shall assure that the positive/negative pressure user seal check is done each time the respirator is donned by an employee. Head coverings must cover respirator head straps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a user seal check shall preclude that person from entering the regulated area until resolution of the problem.

H. Maintenance and Care of Respirators: The Respiratory Protection Program Coordinator shall submit evidence and documentation showing compliance with 29 CFR 1910.134 (h) Maintenance and Care of Respirators.

I. Supplied Air Systems: If a supplied air system is used, the system shall meet all requirements of 29 CFR 1910.134 and the ANSI/Compressed Gas Association (CGA) Commodity Specification for Air current requirements for Type 1 - Grade D breathing air. Low pressure systems are not allowed to be used on asbestos abatement projects. Supplied Air respirator use shall be in accordance with EPA/NIOSH publication EPA-560-OPTS-86-001 "A Guide to Respiratory Protection for the Asbestos Abatement Industry". The competent person on site will be responsible for the supplied air system to ensure the safety of the worker.

1.8 WORKER PROTECTION

A. Training of Abatement Personnel: Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926.1101 (k)(9) and any additional State/Local requirements. Training must include, at a minimum, the elements listed at 29 CFR 1926.1101 (k)(9)(viii). Training shall have been conducted by a third party, EPA/State approved trainer meeting the requirements of EPA 40 CFR 763 Appendix C (AHERA MAP). Initial training certificates and current refresher and accreditation proof must be submitted for each person working at the site.

B. Medical Examinations: Medical examinations meeting the requirements of 29 CFR 1926.1101 (m) shall be provided for all personnel working in the regulated area, regardless of exposure levels. A current physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be

provided for each person and shall include in the medical opinion that the person has been evaluated for working in a heat and cold stress environment while wearing personal protective equipment (PPE) and is able to perform the work without risk of material health impairment.

C. Regulated Area Entry Procedure: The Competent Person shall ensure that each time workers enter the regulated area; they remove ALL street clothes in the clean room of the decontamination unit and put on new disposable coveralls, head coverings, a clean respirator, and then proceed through the shower room to the equipment room where they put on non-disposable required personal protective equipment.

D. Decontamination Procedure: The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area.

1. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
2. Still wearing the respirator and completely naked, proceed to the shower. Showering is MANDATORY. Care must be taken to follow reasonable procedures in removing the respirator to avoid inhaling asbestos fibers while showering. The following procedure is required as a minimum:
   a. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
   b. With respirator still in place, thoroughly decontaminate body, hair, respirator face piece, and all other parts of the respirator except the blower and battery pack on a PAPR. Pay particular attention to cleaning the seal between the face and respirator facepiece and under the respirator straps.
   c. Take a deep breath, hold it and/or exhale slowly, completely wetting hair, face, and respirator. While still holding breath, remove the respirator and hold it away from the face before starting to breathe.
3. Carefully decontaminate the facepiece of the respirator inside and out. If using a PAPR, shut down using the following sequence: a) first cap inlets to filters; b) turn blower off to keep debris collected on the inlet side of the filter from dislodging and

contaminating the outside of the unit; c) thoroughly decontaminate blower and hoses; d) carefully decontaminate battery pack with a wet rag being cautious of getting water in the battery pack thus preventing destruction. **(THIS PROCEDURE IS NOT A SUBSTITUTE FOR RESPIRATOR CLEANING!)**

4. Shower and wash body completely with soap and water. Rinse thoroughly.
5. Rinse shower room walls and floor to drain prior to exiting.
6. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

E. Regulated Area Requirements: The Competent Person shall meet all requirements of 29 CFR 1926.1101 (o) and assure that all requirements for regulated areas at 29 CFR 1926.1101 (e) are met. All personnel in the regulated area shall not be allowed to eat, drink, smoke, chew tobacco or gum, apply cosmetics, or in any way interfere with the fit of their respirator.

1.9 DECONTAMINATION FACILITIES

A. Description: Provide each regulated area with separate personnel decontamination facilities (PDF) and waste/equipment decontamination facilities (W/EDF). Ensure that the PDF are the only means of ingress and egress to the regulated area and that all equipment, bagged waste, and other material exit the regulated area only through the W/EDF.

B. General Requirements: All personnel entering or exiting a regulated area must go through the PDF and shall follow the requirements at 29 CFR 1926.1101 (j)(1) and these specifications. All waste, equipment and contaminated materials must exit the regulated area through the W/EDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and W/EDF must be constructed of a minimum of 3 layers of 6-mil opaque fire retardant polyethylene sheeting and be securely attached to existing building components and/or an adequate temporary framework. A minimum of 3 layers of 6-mil poly shall also be used to cover the floor under the PDF and W/EDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weight inner doorway sheets with layers of duct tape or approved equivalent so that they close quickly after release. Put arrows on sheets so they show direction of travel and overlap. If the building adjacent area is

occupied, construct a solid barrier on the occupied side(s) to protect the sheeting and reduce potential for non-authorized personnel entering the regulated area.

C. Temporary Facilities to the PDF and W/EDF: The Competent Person shall provide temporary water service connections to the PDF and W/EDF. Backflow prevention must be provided at the point of connection to the VA system. Water supply must be of adequate pressure and meet requirements of 29 CFR 1910.141(d)(3). Provide adequate temporary overhead electric power with ground fault circuit interruption (GFCI) protection. Provide a sub-panel equipped with GFCI protection for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the PDF and W/EDF. Provide temporary heat, if needed, to maintain 70 degrees F throughout the PDF and W/EDF.

D. Personnel Decontamination Facility (PDF): The Competent Person shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room which is connected to the regulated area. The PDF must be sized to accommodate the number of personnel scheduled for the project. The shower room, located in the center of the PDF, shall be fitted with as many portable showers as necessary to insure all employees can complete the entire decontamination procedure within 15 minutes. The PDF shall be constructed of opaque poly for privacy. The PDF shall be constructed to eliminate any parallel routes of egress without showering.

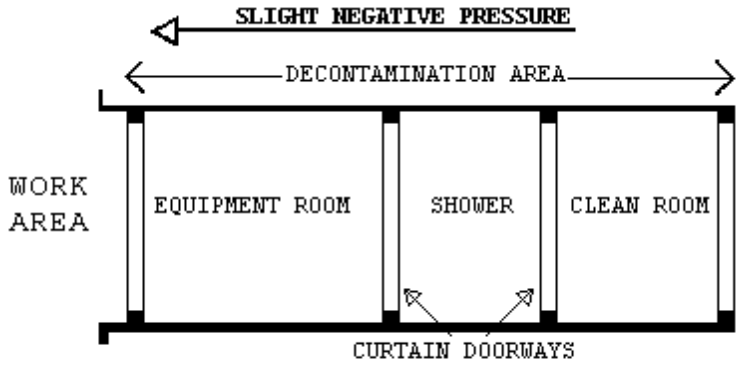
1. Clean Room: The clean room must be physically and visually separated from the rest of the building to protect the privacy of personnel changing clothes. The clean room shall be constructed of at least 3 layers of 6-mil opaque fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide 6-mil poly opaque fire retardant doorways. One doorway shall be the entry from outside the PDF and the second doorway shall be to the shower room of the PDF. The floor of the clean room shall be maintained in a clean, dry and sanitary condition. Shower overflow shall not be allowed into the clean room. Provide 1 storage locker per person. A portable fire extinguisher, minimum 10 pounds capacity, Type ABC, shall be provided in accordance with OSHA and NFPA Standard 10. All persons entering the regulated area shall remove all street clothing

in the clean room and dress in disposable protective clothing and respiratory protection. Any person entering the clean room does so either from the outside with street clothing on or is coming from the shower room completely naked and thoroughly washed. Male/Females required to enter the regulated area shall be ensured of their privacy throughout the entry/exit process by posting guards at both entry points to the PDF so no male/female can enter or exit the PDF during his/her stay in the PDF.

2. Shower Room: The Competent Person shall assure that the shower room is a completely water tight compartment to be used for the movement of all personnel from the clean room to the equipment room and for the showering of all personnel going from the equipment room to the clean room. Each shower shall be constructed so water runs down the walls of the shower and into a drip pan. Install a freely draining smooth floor on top of the shower pan. The shower room shall be separated from the rest of the building and from the clean room and equipment room using air tight walls made from at least 3 layers of 6-mil opaque fire retardant poly. The shower shall be equipped with a shower head and controls, hot and cold water, drainage, soap dish and continuous supply of soap, and shall be maintained in a sanitary condition throughout its use. The controls shall be arranged so an individual can shower without assistance. Provide a flexible hose shower head, hose bibs and all other items shown on Shower Schematic. Waste water will be pumped to a drain after being filtered through a minimum of a 100 micron sock in the shower drain; a 20 micron filter; and a final 5 micron filter. Filters will be changed a minimum of daily or more often as needed. Filter changes must be done in the shower to prevent loss of contaminated water. Hose down all shower surfaces after each shift and clean any debris from the shower pan. Residue is to be disposed of as asbestos waste.
3. Equipment Room: The Competent Person shall provide an equipment room which shall be an air tight compartment for the storage of work equipment/tools, reusable personal protective equipment, except for a respirator and for use as a gross decontamination area for personnel exiting the regulated area. The Competent Person shall ensure that most gross contamination is removed from the outside of

PPE, suits and respirators in the regulated work area, prior to entering the Equipment Room. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made with 2 layers of 6-mil opaque fire retardant poly. The equipment room shall be separated from the regulated area, the shower room and the rest of the building by air tight walls and ceiling constructed of a minimum of 3 layers of 6-mil opaque fire retardant poly. Damp wipe all surfaces of the equipment room after each shift change. Provide an additional loose layer of 6-mil fire retardant poly per shift change and remove this layer after each shift. If needed, provide a temporary electrical sub-panel equipped with GFCI in the equipment room to accommodate any equipment required in the regulated area.

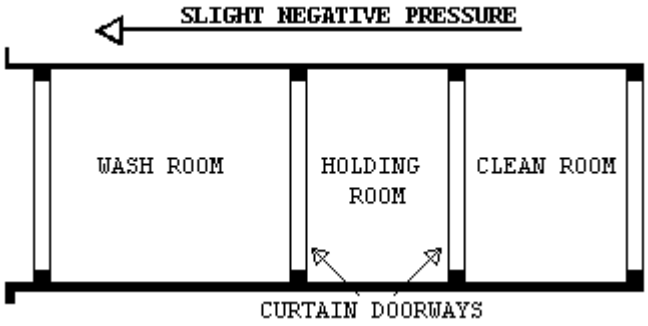
4. The PDF shall be as follows: Clean room at the entrance followed by a shower room followed by an equipment room leading to the regulated area. Each doorway in the PDF shall be a minimum of 2 layers of 6-mil opaque fire retardant poly.



E. Waste/Equipment Decontamination Facility (W/EDF):

1. The Competent Person shall provide a W/EDF consisting of a wash room, holding room, and clean room for removal of waste, equipment and contaminated material from the regulated area. Personnel shall not enter or exit the W/EDF except in the event of an emergency. Clean debris and residue in the W/EDF daily. All surfaces in the W/EDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The W/EDF shall consist of the following:

a. Wash Down Station: Provide an enclosed shower unit in the regulated area just outside the Wash Room as an equipment bag and container cleaning station.
b. Wash Room: Provide a wash room for cleaning of bagged or containerized asbestos containing waste materials passed from the regulated area. Construct the wash room using 50 x 100 mm (2 inches x 4 inches) wood framing or approved equivalent and 3 layers of 6-mil fire retardant poly. Locate the wash room so that packaged materials, after being wiped clean, can be passed to the Holding Room. Doorways in the wash room shall be constructed of 2 layers of 6-mil fire retardant poly.
c. Holding Room: Provide a holding room as a drop location for bagged materials passed from the wash room. Construct the holding room using 50 x 100 mm (2 inches x 4 inches) wood framing or approved equivalent and 3 layers of 6-mil fire retardant poly. The holding room shall be located so that bagged material cannot be passed from the wash room to the clean room unless it goes through the holding room. Doorways in the holding room shall be constructed of 2 layers of 6-mil fire retardant poly.
d. Clean Room: Provide a clean room to isolate the holding room from the exterior of the regulated area. Construct the clean room using 2 inches x 4 inches wood framing or approved equivalent and 2 layers of 6-mil fire retardant poly. The clean room shall be located so as to provide access to the holding room from the building exterior. Doorways to the clean room shall be constructed of 2 layers of 6-mil fire retardant poly. When a negative pressure differential system is used, a rigid enclosure separation between the W/EDF clean room and the adjacent areas shall be provided.
e. The W/EDF shall be as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to outside the regulated area. See diagram.



F. Waste/Equipment Decontamination Procedures: At the washdown station in the regulated area, thoroughly wet clean contaminated equipment and/or sealed polyethylene bags and pass into Wash Room after visual inspection. When passing anything into the Wash Room, close all doorways of the W/EDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the W/EDF. Once inside the Wash Room, wet clean the equipment and/or bags. After cleaning and inspection, pass items into the Holding Room. Close all doorways except the doorway between the Holding Room and the Clean Room. Workers from the Clean Room/Exterior shall enter the Holding Room and remove the decontaminated/cleaned equipment/bags for removal and disposal. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. General Requirements: Prior to the start of work, the contractor shall provide and maintain a sufficient quantity of materials and equipment to assure continuous and efficient work throughout the duration of the project. Work shall not start unless the following items have been delivered to the site and the CPIH/CIH has submitted verification to the VA's representative.

1. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
2. Store all materials subject to damage off the ground, away from wet or damp surfaces and under cover sufficient enough to prevent damage or contamination. Flammable and combustible materials cannot be

stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.

3. The Contractor shall not block or hinder use of buildings by patients, staff, and visitors to the VA in partially occupied buildings by placing materials/equipment in any unauthorized location.
4. The Competent Person shall inspect for damaged, deteriorating or previously used materials. Such materials shall not be used and shall be removed from the worksite and disposed of properly.
5. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mils. For floors and all other uses, sheeting of at least 6-mil shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
6. The method of attaching polyethylene sheeting shall be agreed upon in advance by the Contractor and the VA and selected to minimize damage to equipment and surfaces. Method of attachment may include any combination of moisture resistant duct tape, poly tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or approved equivalent procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions.
7. Polyethylene sheeting utilized for the PDF shall be opaque white or black in color, 6-mil fire retardant poly.
8. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided by the Contractor.
9. An adequate number of HEPA vacuums, scrapers, sprayers, nylon brushes, brooms, disposable mops, rags, sponges, staple guns, shovels, ladders and scaffolding of suitable height and length as well as meeting OSHA requirements, fall protection devices, water hose to reach all areas in the regulated area, airless spray equipment, and any other tools, materials or equipment required to conduct the abatement project. All electrically operated hand tools, equipment, electric cords shall be connected to GFCI protection.

10. Special protection for objects in the regulated area shall be detailed (e.g., plywood over carpeting or hardwood floors to prevent damage from scaffolds, water and falling material).
11. Disposal bags – 2 layers of 6-mil poly for asbestos waste shall be pre-printed with labels, markings and address as required by OSHA, EPA and DOT regulations.
12. The VA shall be provided an advance copy of the Safety Data Sheets (SDS) as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication in the pre-start meeting submittal. Chlorinated compounds shall not be used with any spray adhesive, mastic remover or other product. Appropriate encapsulant(s) shall be provided.
13. OSHA DANGER demarcation signs, as many and as required by OSHA 29 CFR 1926.1101(k)(7) shall be provided and placed by the Competent Person. All other posters and notices required by Federal and State regulations shall be posted in the Clean Room.
14. Adequate and appropriate PPE for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a written hazard assessment conducted under 29 CFR 1910.132(d).

2.2 MONITORING, INSPECTION AND TESTING

A. General:

1. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. OSHA requires that the employee exposure to asbestos must not exceed 0.1 fiber per cubic centimeter (f/cc) of air, averaged over an 8-hour work shift. The CPIH/CIH is responsible for and shall inspect and oversee the performance of the Contractor IH Technician. The IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH/CIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples inside the building, but outside the regulated area. Inside the building, but outside the regulated area air samples shall be collected in the Clean Room of the PDF, at the approximate

location of HEPA exhaust discharge, and at a minimum of three (3) locations in areas immediately outside the regulated work area to satisfy this specification. Additional inspection and testing requirements are also indicated in other parts of this specification.

2. The VA will employ an independent industrial hygienist (VPIH/CIH) consultant and/or use its own IH to perform various services on behalf of the VA. The VPIH/CIH will perform the necessary monitoring, inspection, testing, and other support services to ensure that VA patients, employees, and visitors will not be adversely affected by the abatement work, and that the abatement work proceeds in accordance with these specifications, that the abated areas or abated buildings have been successfully decontaminated. The work of the VPIH/CIH consultant in no way relieves the Contractor from their responsibility to perform the work in accordance with contract/specification requirements, to perform continuous inspection, monitoring and testing for the safety of their employees, and to perform other such services as specified. The cost of the VPIH/CIH and their services will be borne by the VA except for any repeat of final inspection and testing that may be required due to unsatisfactory initial results. Any repeated final inspections and/or testing, if required, will be paid for by the Contractor.
3. If fibers counted by the VPIH/CIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified respective limits, the Contractor shall stop work. The Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the VA's representative. Cost for the confirmation of results will be borne by the Contractor for both the collection and analysis of samples and for the time delay that may/does result for this confirmation. Confirmation sampling and analysis will be the responsibility of the CPIH/CIH with review and approval of the VPIH/CIH. An agreement between the CPIH/CIH and the VPIH/CIH shall be reached on the exact details of the confirmation effort, in writing, including such things as the number of samples,

location, collection, quality control on-site, analytical laboratory, interpretation of results and any follow-up actions. This written agreement shall be co-signed by the IH's and delivered to the VA's representative.

B. Scope of Services of the VPIH/CIH Consultant:

1. The purpose of the work of the VPIH/CIH is to: assure quality; adherence to the specification; resolve problems; prevent the spread of contamination beyond the regulated area; and assure clearance at the end of the project. In addition, their work includes performing the final inspection and testing to determine whether the regulated area or building has been adequately decontaminated. All air monitoring is to be done utilizing PCM/TEM. The VPIH/CIH will perform the following tasks:
   a. Task 1: Establish background levels before abatement begins by collecting background samples. Retain samples for possible TEM analysis.
   b. Task 2: Perform representative air monitoring, inspection, and testing outside the regulated area during actual abatement work to detect any faults in the regulated area isolation and any adverse impact on the surroundings from regulated area activities.
   c. Task 3: Perform unannounced visits to spot check overall compliance of work with contract/specifications. These visits may include any inspection, monitoring, and testing inside and outside the regulated area and all aspects of the operation except personnel monitoring.
   d. Task 4: Provide support to the VA representative such as evaluation of submittals from the Contractor, resolution of conflicts, interpret data, etc.
   e. Task 5: Perform, in the presence of the VA representative, final inspection and testing of a decontaminated regulated area at the conclusion of the abatement to certify compliance with all regulations and VA requirements/specifications.
   f. Task 6: Issue certificate of decontamination for each regulated area and project report.

2. All documentation, inspection results and testing results generated by the VPIH/CIH will be available to the Contractor for information and consideration. The Contractor shall cooperate with and support the VPIH/CIH for efficient and smooth performance of their work.
3. The monitoring and inspection results of the VPIH/CIH will be used by the VA to issue any Stop Removal orders to the Contractor during abatement work and to accept or reject a regulated area or building as decontaminated.

C. Monitoring, Inspection and Testing by Contractor CPIH/CIH: The Contractor's CPIH/CIH is responsible for managing all monitoring, inspections, and testing required by these specifications, as well as any and all regulatory requirements adopted by these specifications. The CPIH/CIH is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Contractor's personnel. Safety and health conditions and the provision of those conditions inside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Contractor/Competent Person. The person performing the personnel and area air monitoring inside the regulated area shall be an IH Technician, who shall be trained and shall have specialized field experience in sampling and analysis. The IH Technician shall have successfully completed a NIOSH 582 Course or equivalent and provide documentation. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytical Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA AHERA/State Contractor/Supervisor and Building Inspector. The IH Technician shall have participated in five abatement projects collecting personal and area samples and have experience in substantially similar projects in size and scope. The analytical laboratory used by the Contractor to analyze the samples shall be AIHA accredited for asbestos PAT and approved by the VA prior to start of the project. A daily log shall be maintained by the CPIH/CIH or IH Technician, documenting all OSHA requirements for personal and area air monitoring for asbestos in 29 CFR 1926.1101(f), (g) and Appendix A. This log shall be made available to the VA representative and the VPIH/CIH upon request. The log will

contain, at a minimum, information on personnel or area samples, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. The CPIH/CIH shall collect and analyze samples for each representative job being done in the regulated area, i.e., removal, wetting, clean-up, and load-out. No fewer than two (2) personal air samples or 25 percent of representative workforce per shift shall be collected, whichever is greater, in the regulated area; a minimum of three (3) area air samples at locations inside the building but immediately outside the regulated work area; one (1) area air sample shall be collected daily in the Clean Room of the PDF; and one (1) area air sample shall be collected daily at the approximate location of HEPA exhaust discharge. In addition to the continuous monitoring required, the CPIH/CIH will perform inspection and testing at the final stages of abatement for each regulated area as specified in the CPIH/CIH responsibilities. Additionally, the CPIH/CIH will monitor and record pressure readings within the containment daily with a minimum of two readings at the beginning and at the end of a shift, and submit the data in the daily report.

2.3 ASBESTOS HAZARD ABATEMENT PLAN

A. The Contractor shall have an established an Asbestos Hazard Abatement Plan (AHAP) in printed form and loose leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the procedures to be followed during all phases of the work by the Contractor's personnel. The AHAP must be modified as needed to address specific requirements of this project and the specifications. The AHAP shall be submitted for review and approval to the VA prior to the start of any abatement work. The minimum topics and areas to be covered by the AHAPs are:

1. Minimum Personnel Qualifications
2. Emergency Action Plan/Contingency Plans and Arrangements
3. Security and Safety Procedures
4. Respiratory Protection/Personal Protective Equipment Program and Training
5. Medical Surveillance Program and Recordkeeping

6. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area
7. Decontamination Facilities and Entry/Exit Procedures (PDF and W/EDF)
8. Negative Pressure Systems Requirements
9. Monitoring, Inspections, and Testing
10. Removal Procedures for ACM
11. Removal of Contaminated Soil (if applicable)
12. Encapsulation Procedures for ACM
13. Disposal of ACM waste/equipment
14. Regulated Area Decontamination/Clean-up
15. Regulated Area Visual and Air Clearance
16. Project Completion/Closeout

2.4 SUBMITTALS

A. Pre-Start Meeting Submittals:

1. Submit to the VA a minimum of 14 days prior to the pre-start meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-start meeting for this project:
   a. Submit a detailed work schedule for the entire project reflecting contract documents and the phasing/schedule requirements from the CPM chart.
   b. Submit a staff organization chart showing all personnel who will be working on the project and their capacity/function. Provide their qualifications, training, accreditations, and licenses, as appropriate. Provide a copy of the "Certificate of Worker's Acknowledgment" and the "Affidavit of Medical Surveillance and Respiratory Protection" for each person.
   c. Submit Asbestos Hazard Abatement Plan developed specifically for this project, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH/CIH.
   d. Submit the specifics of the materials and equipment to be used for this project with manufacturer names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
      1) Supplied air system, negative air machines, HEPA vacuums, air monitoring pumps, calibration devices, pressure differential monitoring device and emergency power generating system.

2) Waste water filtration system, shower system, containment barriers.
3) Encapsulants, surfactants, hand held sprayers, airless sprayers, glovebags, and fire extinguishers.
4) Respirators, protective clothing, fall protection and other required personal protective equipment.
5) Fire safety equipment to be used in the regulated area.

e. Submit the name, location, and phone number of the approved landfill; proof/verification the landfill is approved for ACM disposal; the landfill's requirements for ACM waste; the type of vehicle to be used for transportation; and name, address, and phone number of subcontractor, if used. Proof of asbestos training for transportation personnel shall be provided.
f. Submit required notifications and arrangements made with regulatory agencies having regulatory jurisdiction and the specific contingency/emergency arrangements made with local health, fire, ambulance, hospital authorities and any other notifications/arrangements.
g. Submit the name, location and verification of the laboratory and/or personnel to be used for analysis of air and/or bulk samples. Personal air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. Area or clearance air monitoring shall be conducted in accordance with EPA AHERA protocols.
h. Submit qualifications verification: Submit the following evidence of qualifications. Make sure that all references are current and verifiable by providing current phone numbers and documentation.
1) Asbestos Abatement Company: Project experience within the past 3 years; listing projects first most similar to this project: Project Name; Type of Abatement; Duration; Cost; Reference Name/Phone Number; Final Clearance; Completion Date
2) List of project(s) halted by owner, A/E, IH, regulatory agency in the last 3 years: Project Name; Reason; Date; Reference Name/Number; Resolution
3) List asbestos regulatory citations (e.g., OSHA), notices of violations (e.g., Federal and state EPA), penalties, and

legal actions taken against the company including the company's officers (including damages paid) in the last 3 years. Provide copies and all information needed for verification.

i. Submit information on personnel: Provide a resume; address each item completely; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH/CIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and that the company has implemented a medical surveillance program and written respiratory protection program, and maintains recordkeeping in accordance with the above regulation. Submit the phone number and doctor/clinic/hospital used for medical evaluations.

1) CPIH/CIH and IH Technician: Name; years of abatement experience; list of projects similar to this one; certificates, licenses, accreditations for proof of AHERA/OSHA specialized asbestos training; professional affiliations; medical opinion; and current respirator fit test.
2) Competent Person(s)/Supervisor(s): Number; names; last four digits of social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects in size/complexity as Competent Person/Supervisor; as a worker; certificates, licenses, accreditations; proof of AHERA/OSHA specialized asbestos training; maximum number of personnel supervised on a project; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.
3) Workers: Numbers; names; last four digits of social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion (asbestos surveillance and respirator use); and current respirator fit test.

j. Submit copies of State license for asbestos abatement; copy of insurance policy, including exclusions with a letter from agent

stating in plain language the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of AHAPs incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who performs and how is personal air monitoring of abatement workers conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; and copies of monitoring results of the five referenced projects listed and analytical methods used.

k. Rented equipment must be decontaminated prior to returning to the rental agency.

l. Submit, before the start of work, the manufacturer's technical data for all types of encapsulants, all SDS and application instructions.

B. Submittals During Abatement:

1. The Competent Person shall maintain and submit a daily log at the regulated area documenting the dates and times of the following: purpose, attendees and summary of meetings; all personnel entering/exiting the regulated area; document and discuss the resolution of unusual events such as barrier breeching, equipment failures, emergencies, and any cause for stopping work; and representative air monitoring and results/TWA's/EL's. Submit this information daily to the VA's representative.
2. The CPIH/CIH shall document and maintain the inspection and approval of the regulated area preparation prior to start of work and daily during work.
   a. Removal of any poly barriers.
   b. Visual inspection/testing by the CPIH/CIH or IH Technician prior to application of lockdown encapsulant.
   c. Packaging and removal of ACM waste from regulated area.
   d. Disposal of ACM waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

C. Submittals at Completion of Abatement: The CPIH/CIH shall submit a project report consisting of the daily log book requirements and

documentation of events during the abatement project including Waste Shipment Records signed by the landfill's agent. It will also include information on the containment and transportation of waste from the containment with applicable Chain of Custody forms. The report shall include a certificate of completion, signed and dated by the CPIH/CIH, in accordance with Attachment #1. All clearance and perimeter area samples must be submitted. The VA representative will retain the abatement report after completion of the project and provide copies of the abatement report to VAMC Office of COR and the Safety Office.

2.5 ENCAPSULANTS

A. Types of Encapsulants:

1. The following four types of encapsulants, if used, must comply with performance requirements as stated in paragraph 2.5.2:
   a. Removal encapsulant - used as a wetting agent to remove ACM.
   b. Bridging encapsulant - provides a tough, durable coating on ACM.
   c. Penetrating encapsulant - penetrates/encapsulates ACM at least 13 mm (1/2 inches).
   d. Lockdown encapsulant - seals microscopic fibers on surfaces after ACM removal.

B. Performance Requirements:

1. Encapsulants shall meet the latest requirements of EPA; shall not contain toxic or hazardous substances; or solvents; and shall comply with the following performance requirements:
   a. General Requirements for all Encapsulants:
      1) ASTM E84: Flame spread of 25; smoke emission of 50.
      2) University of Pittsburgh Protocol: Combustion Toxicity; zero mortality.
      3) ASTM C732: Accelerated Aging Test; Life Expectancy - 20 years.
      4) ASTM E96: Permeability - minimum of 0.4 perms.
   b. Bridging/Penetrating Encapsulants:
      1) ASTM E736: Cohesion/Adhesion Test - 24 kPa (50 pounds/square foot).
      2) ASTM E119: Fire Resistance - 3 hours (Classified by UL for use on fibrous/cementitious fireproofing).

3) ASTM D2794: Gardner Impact Test; Impact Resistance - minimum 11.5 kg-mm (43 in/lb).
4) ASTM D522: Mandrel Bend Test; Flexibility - no rupture or cracking.

c. Lockdown Encapsulants:
1) ASTM E119: Fire resistance - 3 hours (tested with fireproofing over encapsulant applied directly to steel member).
2) ASTM E736: Bond Strength - 48 kPa (100 pounds/square foot) (test compatibility with cementitious and fibrous fireproofing).
3) In certain situations, encapsulants may have to be applied to hot pipes/equipment. The encapsulant must be able to withstand high temperatures without cracking or creating any noxious gaseous or vapors during or after application.

C. Certificates of Compliance: The Contractor shall submit to the VA representative certification from the manufacturer indicating compliance with performance requirements for encapsulants when applied according to manufacturer recommendations.

PART 3 - EXECUTION

3.1 REGULATED AREA PREPARATIONS

A. Site Security:
1. Regulated area access is to be restricted only to authorized, trained/accredited and protected personnel. These may include the Contractor's employees, employees of Subcontractors, VA employees and representatives, State and Local inspectors, and any other designated individuals. A list of authorized personnel shall be established prior to commencing the project and be posted in the clean room of the decontamination unit.
2. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Competent Person by anyone observing the entry. The Competent Person shall immediately require any unauthorized person to leave the regulated area and then notify the VA Contracting Officer or VA Representative using the most expeditious means.

3. A log book shall be maintained in the clean room of the decontamination unit. Anyone who enters the regulated area must record their name, affiliation, time in, and time out for each entry.
4. Access to the regulated area shall be through a single decontamination unit. All other access (doors, windows, hallways, etc.) shall be sealed and demarcated as an asbestos regulated work area to prevent entry to or exit from the regulated area unless in the event of an emergency. The only exceptions for this requirement are the waste/equipment load-out area which shall be sealed except during the removal of containerized asbestos waste from the regulated area, and emergency exits. Emergency exits shall not be locked from the inside; however, they shall be sealed with poly sheeting and taped until needed. In any situation where exposure to high temperatures which may result in a flame hazard, fire retardant poly sheeting must be used.
5. The Contractor's Competent Person shall control site security during abatement operations in order to isolate work in progress and protect adjacent personnel. A 24-hour security system shall be provided at the entrance to the regulated area to assure that all entrants are logged in/out and that only authorized personnel are allowed entrance.
6. The Contractor will have the VA's assistance in notifying adjacent personnel of the presence, location and quantity of ACM in the regulated area and enforcement of restricted access by the VA's employees.
7. The regulated area shall be locked during non-working hours and secured by VA Representative or Competent Person. The VA Police shall be informed of asbestos abatement regulated areas to provide security checks during facility rounds and emergency response.

B. Signage and Power Management:

1. Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area. Signs shall be posted at a distance sufficiently far enough away from the regulated area to permit any personnel to read the sign and take the necessary measures to avoid exposure. Additional signs

will be posted following construction of the regulated area enclosure.

2. Shut down and lock out/tag out electric power to the regulated area. Provide temporary power and lighting. Insure safe installation including GFCI of temporary power sources and equipment by compliance with all applicable electrical code and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.
3. Shut down and lock out/tag out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area. Investigate the regulated area and agree on pre-abatement condition with the VA's representative. Seal all intake and exhaust vents in the regulated area with duct tape and 2 layers of independently installed 6-mil poly. Also, seal any seams in system components that pass through the regulated area. Remove all contaminated HVAC system filters and place in labeled 6-mil polyethylene disposal bags for staging and eventual disposal as asbestos waste.

C. Negative Pressure Filtration System:

1. The Contractor shall provide enough HEPA negative air machines to effect $\geq$ - 0.02 inch WCG pressure differential inside the regulated work area. The Competent Person shall determine the number of units needed for the regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the cubic feet per minute (CFM) for each unit to determine the number of units needed to effect $\geq$ - 0.02 inch WCG pressure inside the regulated work area. Provide standby units in the event of machine failure and/or emergency in an adjacent area. HEPA equipped negative air machines shall be discharged outside of the building a minimum of 30 feet from building make-up air, doors, open windows, patients, visitors and staff.
2. NIOSH has done extensive studies and has determined that negative air machines typically operate at ~50 percent efficiency. The contractor shall consider this in their determination of number of units needed to provide $\geq$ - 0.02 inch WCG pressure differential inside the regulated work area. The contractor shall use double the

number of machines, based on their calculations, or submit proof their machines operate at stated capacities, at a 2 inches pressure drop across the filters.

3. Design and Layout:
   a. Before start of work submit the design and layout of the regulated area and the negative air machines. The submittal shall indicate the number of, location of and size of negative air machines. The point(s) of exhaust, air flow within the regulated area, anticipated negative pressure differential, and supporting calculations for sizing shall be provided. In addition, submit the following:
      1) Method of supplying power to the units and designation/location of the panels.
      2) Description of testing method(s) for correct air volume and pressure differential.
      3) If auxiliary power supply is to be provided for the negative air machines, provide a schematic diagram of the power supply and manufacturer's data on the generator and switch.
4. Negative Air Machines (Hepa Units):
   a. Negative Air Machine Cabinet: The cabinet shall be constructed of steel or other durable material capable of withstanding potential damage from rough handling and transportation. The width of the cabinet shall be less than 30 inches in order to fit in standard doorways. The cabinet must be factory sealed to prevent asbestos fibers from being released during use, transport, or maintenance. Any access to and replacement of filters shall be from the inlet end. The unit must be on casters or wheels.
   b. Negative Air Machine Fan: The rating capacity of the fan must indicate the CFM under actual operating conditions. Manufacturer's typically use "free-air" (no resistance) conditions when rating fans. The fan must be a centrifugal type fan.
   c. Negative Air Machine Final Filter: The final filter shall be a HEPA filter. The filter media must be completely sealed on all edges within a structurally rigid frame. The filter shall align with a continuous flexible gasket material in the negative air

machine housing to form an air tight seal. Each HEPA filter shall be certified by the manufacturer to have an efficiency of not less than 99.97 percent. Testing shall have been done in accordance with Military Standard MIL-STD-282 and Army Instruction Manual 136-300-175A. Each filter must bear a UL586 label to indicate ability to perform under specified conditions. Each filter shall be marked with the name of the manufacturer, serial number, air flow rating, efficiency and resistance, and the direction of test air flow.

d. Negative Air Machine Pre-filters: The pre-filters, which protect the final HEPA filter by removing larger particles, are required to prolong the operating life of the HEPA filter. Two stages of pre-filtration are required. A first stage pre-filter shall be a low efficiency type for particles 10 µm or larger. A second stage pre-filter shall have a medium efficiency effective for particles down to 5 µm or larger. Pre-filters shall be installed either on or in the intake opening of the NAM and the second stage filter must be held in place with a special housing or clamps.
e. Negative Air Machine Instrumentation: Each unit must be equipped with a gauge to measure the pressure drop across the filters and to indicate when filters have become loaded and need to be changed. A table indicating the cfm for various pressure readings on the gauge shall be affixed near the gauge for reference or the reading shall indicate at what point the filters shall be changed, noting cfm delivery. The unit must have an elapsed time meter to show total hours of operation.
f. Negative Air Machine Safety and Warning Devices: An electrical/ mechanical lockout must be provided to prevent the fan from being operated without a HEPA filter. Units must be equipped with an automatic shutdown device to stop the fan in the event of a rupture in the HEPA filter or blockage in the discharge of the fan. Warning lights are required to indicate normal operation; too high a pressure drop across filters; or too low of a pressure drop across filters.
g. Negative Air Machine Electrical: All electrical components shall be approved by the National Electrical Manufacturer's Association

(NEMA) and Underwriters Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.

h. It is essential that replacement HEPA filters be tested using an "in-line" testing method, to ensure the seal around the periphery was not damaged during replacement. Damage to the outer HEPA filter seal could allow contaminated air to bypass the HEPA filter and be discharged to an inappropriate location. Contractor will provide written documentation of test results for negative air machine units with HEPA filters.

5. Pressure Differential: The fully operational negative air system within the regulated area shall continuously maintain a pressure differential $\geq$ - 0.02 inch WCG inside the regulated work area. Before any disturbance of any asbestos material, this shall be demonstrated to the VA by use of a pressure differential meter/manometer as required by OSHA 29 CFR 1926.1101(g)(5)(i). The Competent Person shall be responsible for providing, maintaining, and documenting the negative pressure and air changes as required by OSHA and this specification.
6. Monitoring: The pressure differential shall be continuously monitored and recorded between the regulated area and the area outside the regulated area with a monitoring device that incorporates a strip chart recorder. The strip chart recorder shall become part of the project log and shall indicate at least $\geq$ - 0.02 inch WCG pressure differential inside the regulated work area for the duration of the project.
7. Auxiliary Generator: If the building is occupied during abatement, provide an auxiliary gasoline/diesel generator located outside the building in an area protected from the weather. In the event of a power failure of the general power grid and the VAMC emergency power grid, the generator must automatically start and supply power to a minimum of 50 percent of the negative air machines in operation.
8. Supplemental Make-Up Air Inlets: Provide, as needed for proper air flow in the regulated area, in a location approved by the VA, openings in the plastic sheeting to allow outside air to flow into the regulated area. Auxiliary makeup air inlets must be located as

far from the negative air machines as possible, off the floor near the ceiling, and away from the barriers that separate the regulated area from the occupied clean areas. Cover the inlets with weighted flaps which will seal in the event of failure of the negative pressure system.

9. Testing The System: The negative pressure system must be tested before any ACM is disturbed in any way. After the regulated area has been completely prepared, the decontamination units set up, and the negative air machines installed, start the units up one at a time. Demonstrate and document the operation and testing of the negative pressure system to the VA using smoke tubes and a negative pressure gauge. Verification and documentation of adequate negative pressure differential across each barrier must be done at the start of each work shift.
10. Demonstration of the Negative Pressure Filtration System:
    a. The demonstration of the operation of the negative pressure system to the VA shall include, but not be limited to, the following:
        1) Plastic barriers and sheeting move lightly in toward the regulated area.
        2) Curtains of the decontamination units move in toward regulated area.
        3) There is a noticeable movement of air through the decontamination units. Use the smoke tube to demonstrate air movement from the clean room to the shower room to the equipment room to the regulated area.
        4) Use smoke tubes to demonstrate air is moving across all areas in which work is to be done. Use a differential pressure gauge to indicate a negative pressure of at > - 0.02 inch across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.
11. Use of the Negative Pressure Filtration System During Abatement Operations:
    a. Start units before beginning any disturbance of ACM occurs. After work begins, the units shall run continuously, maintaining 4

actual air changes per hour at a negative pressure differential of > - 0.02 inch water column gauge, for the duration of the work until a final visual clearance and final air clearance has been successfully completed.

b. No negative air units shall be shut down at any time unless authorized by the VA Contracting Officer, verbally and in writing.

c. Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.

d. Abatement work shall begin at a location farthest from the units and proceed towards them. If an electric failure occurs, the Competent Person shall stop all abatement work and immediately begin wetting all exposed asbestos materials for the duration of the power outage. Abatement work shall not resume until power is restored and all units are operating properly again.

e. The negative air machines shall continue to run after all work is completed and until a final visual clearance and a final air clearance has been successfully completed for that regulated area.

12. Dismantling The System: After completion of the final visual and final air clearance has been obtained by the VPIH/CIH, the units may be shut down. The unit exterior surfaces shall have been completely decontaminated; pre-filters are not to be removed and the units inlet/outlet sealed with 2 layers of 6-mil poly immediately after shut down. No filter removal shall occur at the VA site following successful completion of site clearance. OSHA/EPA/DOT asbestos labels shall be attached to the units.

D. Containment Barriers and Coverings in the Regulated Area:

1. General: Seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. All surfaces in the regulated area must be covered to prevent contamination and to facilitate clean-up. Should adjacent areas become contaminated as a result of the work, Contractor shall immediately stop work and clean

up the contamination at no additional cost to the VA. Provide firestopping and identify all fire barrier penetrations due to abatement work as specified in Section 3.1.4.8; FIRESTOPPING.

2. Preparation Prior To Sealing: The Regulated Area: Place all tools, scaffolding, materials and equipment needed for working in the regulated area prior to erecting any plastic sheeting. All uncontaminated removable furniture, equipment and/or supplies shall be removed by the VA from the regulated area before commencing work. Any objects not scheduled for removal remaining in the regulated area shall be completely covered with 2 layers of 6-mil fire retardant poly sheeting and secured with duct tape. Lock out and tag out any HVAC/electrical systems in the regulated area.
3. Controlling Access to The Regulated Area: Access to the regulated area is allowed only through the personnel decontamination facility (PDF). All other means of access shall be eliminated and OSHA DANGER demarcation signs posted as required by OSHA. If the regulated area is adjacent to, or within view of an occupied area, provide a visual barrier of 6-mil opaque fire retardant poly to prevent building occupant observation. If the adjacent area is accessible to the public, the barrier must be solid and capable of withstanding the negative pressure.

4. Critical Barriers: Completely separate any operations in the regulated area from adjacent areas using 2 layers of 6-mil fire retardant poly and duct tape. Individually seal with 2 layers of 6-mil poly and duct tape all HVAC openings into the regulated area. Individually seal all lighting fixtures, clocks, doors, windows, convectors, speakers, or any other objects/openings in the regulated area. Heat must be shut off any objects covered with poly.
5. Primary Barriers:
   a. Cover the regulated area with two layers of 6-mil fire retardant poly on the floors and two layers of 4 mil, fire retardant poly on the walls, unless otherwise directed in writing by the VA representative. Floor layers must form a right angle with the wall and turn up the wall at least 300 mm (12 inches). Seams must overlap at least 1800 mm (6 feet) and must be spray glued and taped. Install sheeting so that layers can be removed

independently from each other. Carpeting shall be covered with three layers of 6-mil poly. Corrugated cardboard sheets must be placed between the bottom and middle layers of poly. Mechanically support and seal with duct tape and glue all wall layers.

b. If stairs and ramps are covered with 6-mil plastic, two layers must be used. Provide 19 mm (3/4 inch) exterior grade plywood treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.

6. Secondary Barriers: A loose layer of 6-mil shall be used as a drop cloth to protect the primary layers from debris generated during the abatement. This layer shall be replaced as needed during the work.
7. Extension of the Regulated Area: If the enclosure of the regulated area is breached in any way that could allow contamination to occur, the affected area shall be included in the regulated area and constructed as per this section. Decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.
8. Firestopping:
   a. Through penetrations caused by cables, cable trays, pipes, sleeves, conduits, etc. must be firestopped with a fire-rated firestop system providing an air tight seal.
   b. Firestop materials that are not equal to the wall or ceiling penetrated shall be brought to the attention of the VA Representative. The contractor shall list all areas of penetration, the type of sealant used, and whether or not the location is fire rated. Any discovery of penetrations during abatement shall be brought to the attention of the VA representative immediately. All walls, floors and ceilings are considered fire rated unless otherwise determined by the VA Representative or Fire Marshall.
   c. Any visible openings whether or not caused by a penetration shall be reported by the Contractor to the VA Representative for a sealant system determination. Firestops shall meet ASTM E814 and UL 1479 requirements for the opening size, penetrant, and fire rating needed.

E. Sanitary Facilities: The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.

F. Personal Protective Equipment: Provide whole body clothing, head coverings, gloves and foot coverings and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

G. Pre-Cleaning:

1. The VA will provide water for abatement purposes. The Contractor shall connect to the existing VA system. The service to the shower(s) shall be supplied with backflow prevention.
2. Pre-cleaning of ACM contaminated items shall be performed after the enclosure has been erected and negative pressure has been established in the work area. All workers performing pre-cleaning activities must don appropriate personal protective equipment (PPE), as specified throughout this document and as approved in the Contractor’s work plan. After items have been pre-cleaned and decontaminated, they may be removed from the work area for storage until the completion of abatement in the work area.
3. Pre-clean all movable objects within the regulated area using a HEPA filtered vacuum and/or wet cleaning methods as appropriate. After cleaning, these objects shall be removed from the regulated area and carefully stored in an uncontaminated location. Drapes, clothing, upholstered furniture and other fabric items shall be disposed of as asbestos contaminated waste. Cleaning these asbestos contaminated items utilizing HEPA vacuum techniques and off-premises steam cleaning is very difficult and cannot guarantee decontamination. Carpeting will be disposed of prior to abatement if in the regulated area. If ACM floor tile is attached to the carpet while the Contractor is removing the carpet that section of the carpet will be disposed of as asbestos waste.
4. Pre-clean all fixed objects in the regulated area using HEPA filtered vacuums and/or wet cleaning techniques as appropriate.

Careful attention must be paid to machinery behind grills or gratings where access may be difficult but contamination may be significant. Also, pay particular attention to wall, floor and ceiling penetration behind fixed items. After pre-cleaning, enclose fixed objects with 2 layers of 6-mil poly and seal securely in place with duct tape. Objects (e.g., permanent fixtures, shelves, electronic equipment, laboratory tables, sprinklers, alarm systems, closed circuit TV equipment and computer cables) which must remain in the regulated area and that require special ventilation or enclosure requirements should be designated here along with specified means of protection. Contact the manufacturer for special protection requirements.

5. Pre-clean all surfaces in the regulated area using HEPA filtered vacuums and/or wet cleaning methods as appropriate. Do not use any methods that would raise dust such as dry sweeping or vacuuming with equipment not equipped with HEPA filters. Do not disturb asbestos-containing materials during this pre-cleaning phase.

H. Pre-Abatement Activities:

1. Pre-Abatement Meeting: The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH/CIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the Contractor, the CPIH/CIH, Competent Person(s), the VA representative(s), and the VPIH/CIH. The purpose of the meeting is to discuss any aspect of the submittals needing clarification or amplification and to discuss any aspect of the project execution and the sequence of the operation. The Contractor shall be prepared to provide any supplemental information/documentation to the VA's representative regarding any submittals, documentation, materials or equipment. Upon satisfactory resolution of any outstanding issues, the VA's representative will issue a written order to proceed to the Contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.
2. Pre-Abatement Construction and Operations:

a. Perform all preparatory work for the first regulated area in accordance with the approved work schedule and with this specification.
b. Upon completion of all preparatory work, the CPIH/CIH will inspect the work and systems and will notify the VA's representative when the work is completed in accordance with this specification. The VA's representative may inspect the regulated area and the systems with the VPIH/CIH and may require that upon satisfactory inspection, the Contractor's employees perform all major aspects of the approved AHAP(s), especially worker protection, respiratory systems, contingency plans, decontamination procedures, and monitoring to demonstrate satisfactory operation. The operational systems for respiratory protection and the negative pressure system shall be demonstrated for proper performance.
c. The CPIH/CIH shall document the pre-abatement activities described above and deliver a copy to the VA's representative.
d. Upon satisfactory inspection of the installation of and operation of systems, the VA's representative will notify the Contractor in writing to proceed with the asbestos abatement work in accordance with this specification and all applicable regulations.

3. Pre-Abatement Inspections and Preparations:
   a. Before any work begins on the construction of the regulated area, the Contractor will:
      1) Conduct a space-by-space inspection with an authorized VA representative and prepare a written inventory of all existing damage in those spaces where asbestos abatement will occur. Still or video photography may be used to supplement the written damage inventory. Document will be signed and certified as accurate by both parties.
      2) A NESHAP (destructive) ACM inspection shall be conducted on all building structures that will be demolished. Ensure the following areas are inspected on the project: lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside utility chases/walls; transite piping/ductwork/sheets; behind radiators; lab fume hoods;

transite lab countertops; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawlspaces (previous abatement contamination); flooring/mastic covered by carpeting/new flooring; exterior insulated wall panels; on underground fuel tanks; and steam line trench coverings. Verify during NESHAP survey that no other suspect ACM is present.

3) Ensure that all furniture, machinery, equipment, curtains, drapes, blinds, and other movable objects required to be removed from the regulated area have been cleaned and removed or properly protected from contamination.

4) If present and required, remove and dispose of carpeting from floors in the regulated area.
5) Inspect existing firestopping in the regulated area. Correct as needed.

3.2 REMOVAL OF ACM

A. Wetting ACM:

1. Use amended water for the wetting of ACM prior to removal. The Competent Person shall assure the wetting of ACM meets the definition of "adequately wet" in the EPA NESHAP regulation and OSHA’s “wet methods” for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.
2. Amended Water: Provide water to which a surfactant has been added to wet the ACM and reduce the potential for fiber release during disturbance of ACM. The mixture must be equal to or greater than the wetting provided by water amended by a surfactant consisting of one ounce of 50 percent polyoxyethylene ester and 50 percent polyoxyethylene ether mixed with 5 gallons (19L) of water.
3. Removal Encapsulant: When authorized by VA, provide a removal encapsulant designed specifically for the removal of ACM. The material must, when used, result in adequate wetting of the ACM and retard fiber release during removal.

B. Secondary Barrier and Walkways:

1. Install as a drop cloth a 6-mil poly sheet at the beginning of each work shift where removal is to be done during that shift. Completely

cover floors and any walls within 10 feet (3 meters) of the area where work is to done. Secure the secondary barrier with duct tape to prevent it from moving or debris from getting behind it. Remove the secondary barrier at the end of the shift or as work in the area is completed. Keep residue on the secondary barrier wetted. When removing, fold inward to prevent spillage and place in a disposal bag.

2. Install walkways using 6-mil black poly between the regulated area and the decontamination facilities (PDF and W/EDF) to protect the primary layers from contamination and damage. Install the walkways at the beginning of each shift and remove at the end of each shift.

C. Wet Removal of ACM:

1. Adequately and thoroughly wet the ACM to be removed prior to removal with amended water or when authorized by VA, removal encapsulant to reduce/prevent fiber release to the air. Adequate time must be allowed for the amended water or removal encapsulant to saturate the ACM. Abatement personnel must not disturb dry ACM. Use a fine spray of amended water or removal encapsulant. Saturate the material sufficiently to wet to the substrate without causing excessive dripping. The material must be sprayed repeatedly/continuously during the removal process in order to maintain adequately wet conditions. Removal encapsulants must be applied in accordance with the manufacturer's written instructions. Perforate or carefully separate, using wet methods, an outer covering that is painted or jacketed in order to allow penetration and wetting of the material. Where necessary, carefully remove covering while wetting to minimize fiber release. **In no event shall dry removal occur except when authorized in writing by the VPIH/CIH and VA when a greater safety hazard (e.g., electricity) is present.**

2. If ACM does not wet well with amended water due to composition, coating or jacketing, remove as follows:
   a. Mist work area continuously with amended water whenever necessary to reduce airborne fiber levels.
   b. Remove saturated ACM in small sections. Do not allow material to dry out. As material is removed, bag material, while still wet

into disposal bags. Twist the bag neck tightly, bend over (gooseneck) and seal with a minimum of three tight wraps of duct tape. Clean /decontaminate the outside of the bag of any residue and move to washdown station adjacent to W/EDF.

c. Fireproofing or Architectural Finish on Scratch Coat: Spray with a fine mist of amended water or removal encapsulant. Allow time for saturation to the substrate. Do not over saturate causing excess dripping. Scrape material from substrate. Remove material in manageable quantities and control falling to staging or floor. If the falling distance is over 20 feet (6 meters), use a drop chute to contain material through descent. Remove residue remaining on the scratch coat after scraping is done using a stiff bristle hand brush. If a removal encapsulant is used, remove residue completely before the encapsulant dries. Periodically re-wet the substrate with amended water as needed to prevent drying of the material before the residue is removed from the substrate.

d. Fireproofing or Architectural Finish on Wire Lath: Spray with a fine mist of amended water or removal encapsulant. Allow time to completely saturate the material. Do not over saturate causing excess dripping. If the surface has been painted or otherwise coated, cut small holes as needed and apply amended water or removal encapsulant from above. Cut saturated wire lath into 2 feet x 6 feet (50mm x 150mm) sections and cut hanger wires. Roll up complete with ACM, cover in burlap and hand place in disposal bag. Do not drop to floor. After removal of lath/ACM, remove any overspray on decking and structure using stiff bristle nylon brushes. Depending on hardness of overspray, scrapers may be needed for removal.

e. Pipe/Tank/Vessel/Boiler Insulation: Remove the outer layer of wrap while spraying with amended water in order to saturate the ACM. Spray ACM with a fine mist of amended water or removal encapsulant. Allow time to saturate the material to the substrate. Cut bands holding pre-formed pipe insulation sections. Slit jacketing at the seams, remove and hand place in a disposal bag. Do not allow dropping to the floor. Remove molded fitting

insulation/mud in large pieces and hand place in a disposal bag. Remove any residue on pipe or fitting with a stiff bristle nylon brush. In locations where pipe fitting insulation is removed from fibrous glass or other non-asbestos insulated straight runs of pipe, remove fibrous material at least 6 inches from the point it contacts the ACM.

D. Wet Removal of Amosite:

1. The following areas shown on drawings indicate locations of amosite ACM which will require local exhaust ventilation and collection as described below, in addition to wet removal. Provide specific description /locations/ drawings.
2. Provide local exhaust ventilation and collection systems to assure collection of amosite fibers at the point of generation. A 300 mm (12") flexible rigid non-collapsing duct shall be shall be located no more than 600 mm (2 feet) from any scraping/brushing activity. Primary filters must be replaced every 30 minutes on the negative air machines. Each scraping/brushing activity must have a negative air machine devoted to it. For pre-molded pipe insulation or cutting wire lathe attach a 1200 mm (4 feet) square flared end piece on the intake of the duct. Support the duct horizontally at a point 600 mm (2 feet) below the work to effect capture. One person in the crew shall be assigned to operate the duct collection system on a continual basis.
3. Amosite does not wet well with amended water. Submit full information/documentation on the wetting agent proposed prior to start for review and approval by the VPIH/CIH and VA Contracting Officer. Insure that the material is worked on in small sections and is thoroughly and continuously wetted. Package as soon as possible while wet. Remove as required.

E. Removal of ACM/Dirt Floors and Other Special Procedures:

1. Major Abatement on Dirt Floors: When working on dirt floors, remove all visible asbestos debris using wet methods after set-up of PDF, W/EDF, negative air systems as required. Perform work and decontaminate/clean-up; perform lockdown as needed and complete work

as required in these specifications. The asbestos contaminated soil (ACS) shall be removed and/or enclosed.

2. Options for abatement of asbestos contaminated soil include: Removal of top 6 inches of soil; encapsulate the soil using shotcrete or other spray applied concrete materials. Considerations for which option to be used will be made by the VA representative. Factors which may affect which option to be used may include: access to the work area; height of the area (such as is there sufficient height to use concrete materials in the area, etc.). Soils covered with permanent barriers **MUST HAVE PERMANENT SIGNAGE INSTALLED TO WARN AGAINST PENETRATION ASSOCIATED WITH POTENTIAL DISTURBANCE OF ASBESTOS.**
   a. Remove ACS as shown on drawings to a minimum depth of 6 using wet methods. After wetting with amended water to minimize dust, shovel dirt into disposal bags. The CPIH/CIH shall closely monitor work conditions and take appropriate action to protect workers from over exposure to asbestos and heat stress. The minimum number of air changes per hour shall be six using negative air machines. Use of special vacuum truck equipped with HEPA filtration to remove soil is an acceptable option.
   b. Enclosure of ACS using a concrete layer of 4 inches over the entire surface may also be done. Thoroughly dampen soil first with amended water before pouring concrete. Personnel shall be proficient in concrete finishing as well as asbestos trained.
3. Crawlspaces/Pipe Tunnels: When working in crawlspaces or pipe tunnels, remove all visible asbestos debris using wet methods (if possible) after set-up of PDF, W/EDF, and after establishing negative air systems as required. Perform work and decontaminate/clean-up; perform lockdown as needed and complete work as required in these specifications. The asbestos contaminated soil (ACS) shall be removed and/or enclosed. Clearance requirements include confirmation sampling of affected soil by Polarized Light Microscopy (PLM). Clearance sampling requirements are specified in Sections 3.6.4 3.6.5 and 3.6.6.

4. Options for abatement of asbestos contaminated soil include: Removal of top 6 inches of soil; encapsulate the soil using shotcrete or other spray applied concrete materials. Considerations for which option to be used will be made by the VA representative. Factors which may affect which option to be used may include: access to the work area; height of the area (such as is there sufficient height to use concrete materials in the area, etc.).

3.3 LOCKDOWN ENCAPSULATION

A. General: Lockdown encapsulation is an integral part of the ACM removal. At the conclusion of ACM removal and before removal of the primary barriers, the contractor shall encapsulate all surfaces with a bridging encapsulant.

B. Delivery and Storage: Deliver materials to the job site in original, new and unopened containers bearing the manufacturer's name and label as well as the following information: name of material, manufacturer's stock number, date of manufacture, thinning instructions, application instructions and the SDS for the material.

C. Worker Protection: Before beginning work with any material for which an SDS has been submitted, provide workers with any required personal protective equipment. The required personal protective equipment shall be used whenever exposure to the material might occur. In addition to OSHA/specification requirements for respiratory protection, a paint pre-filter and an organic vapor cartridge, at a minimum, shall be used in addition to the HEPA filter when an organic solvent based encapsulant or other solvent is used. The CPIH/CIH shall be responsible for provision of adequate respiratory protection. Note: Flammable and combustible encapsulants or solvents shall not be used, unless authorized in writing by the VA.

D. Encapsulation of Scratch Coat Plaster or Piping:

1. Apply two coats of lockdown encapsulant to the scratch coat plaster or piping after all ACM has been removed. Apply in strict accordance with the manufacturer's instructions. Any deviation from the instructions must be approved by the VA's representative in writing prior to commencing the work.
2. Apply the lockdown encapsulant with an airless sprayer at a pressure and using a nozzle orifice as recommended by the manufacturer. Apply

the first coat while the scratch coat is still damp from the asbestos removal process, after passing the visual inspection. If the surface has been allowed to dry, wet wipe or HEPA vacuum prior to spraying with encapsulant. Apply a second coat over the first coat in strict conformance with the manufacturer's instructions. Color the lockdown encapsulant and contrast the color in the second coat so that visual confirmation of completeness and uniform coverage of each coat is possible. Adhere to the manufacturer's instructions for coloring. At the completion of the encapsulation, the surface must be a uniform third color produced by the mixture.

E. Sealing Exposed Edges: Seal edges of ACM exposed by removal work which is inaccessible, such as a sleeve, wall penetration, etc., with two coats of bridging encapsulant. Prior to sealing, permit the exposed edges to dry completely to permit penetration of the bridging encapsulant. Apply in accordance with 3.3.4 (B).

3.4 DISPOSAL OF ACM WASTE MATERIALS

A. General: Dispose of waste ACM and debris which is packaged in accordance with these specifications, in accordance with OSHA, EPA, State, Local and DOT requirements. The landfill requirements for packaging must also be met. Transport will be in compliance with 49 CFR 171-180 regulations. Disposal shall be done at an approved landfill. Disposal of non-friable ACM shall be done in accordance with applicable regulations.

B. Procedures:

1. The VA must be notified at least 24 hours in advance of any waste removed from the containment.
2. Asbestos waste shall be packaged and moved through the W/EDF into a covered transport container in accordance with procedures is this specification. Waste shall be double-bagged and wetted with amended water prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall be evacuated with HEPA vacuum and securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goose necked prior to tightly sealing with at least three wraps of duct tape. Ensure that unauthorized persons do not have access to the waste material once it is outside the regulated area. All transport containers must be

covered at all times when not in use. NESHAP signs must be on containers during loading and unloading. Material shall not be transported in open vehicles. If drums are used for packaging, the drums shall be labeled properly and shall not be re-used.

3. Waste Load Out: Waste load out shall be done in accordance with the procedures in W/EDF Decontamination Procedures. Sealed waste bags shall be decontaminated on exterior surfaces by wet cleaning and HEPA vacuuming before being placed in the second waste bag and sealed, which then must also be wet wiped and HEPA vacuumed.
4. Asbestos waste with sharp edged components, i.e., nails, screws, lath, strapping, tin sheeting, jacketing, metal mesh, etc., which might tear poly bags shall be wrapped securely in burlap before packaging and, if needed, use a poly lined fiber drum as the second container, prior to disposal.

3.5 PROJECT DECONTAMINATION

A. General:
   1. The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH/CIH.
   2. If the asbestos abatement work is in an area which was contaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal and cleanings of the surfaces of the regulated area after the primary barrier removal.
   3. If the asbestos abatement work is in an area which was uncontaminated prior to the start of abatement, the decontamination will be done by cleaning the primary barrier poly prior to its removal, thus preventing contamination of the building when the regulated area critical barriers are removed.

B. Regulated Area Clearance: Clearance air testing and other requirements which must be met before release of the Contractor and re-occupancy of the regulated area space are specified in Final Testing Procedures.

C. Work Description: Decontamination includes the clearance air testing in the regulated area and the decontamination and removal of the enclosures/facilities installed prior to the abatement work including

primary/critical barriers, PDF and W/EDF facilities, and negative pressure systems.

D. Pre-Decontamination Conditions:
   1. Before decontamination starts, all ACM waste from the regulated area shall be collected and removed, and the loose 6-mil layer of poly removed while being adequately wetted with amended water and disposed of along with any gross debris generated by the work.
   2. At the start of decontamination, the following shall be in place:
      a. Primary barriers consisting of 2 layers of 6-mil poly on the floor and 4 mil poly on the walls.
      b. Critical barriers consisting of 2 layers of 6-mil poly which is the sole barrier between the regulated area and openings to the rest of the building or outside.
      c. Decontamination facilities for personnel and equipment in operating condition and the negative pressure system in operation.

E. First Cleaning: Carry out a first cleaning of all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and HEPA vacuuming. Do not use dry dusting/sweeping/air blowing methods. Use each surface of a wetted cleaning cloth one time only and then dispose of as contaminated waste. Continue this cleaning until there is no visible residue from abated surfaces or poly or other surfaces. Remove all filters in the air handling system and dispose of as ACM waste in accordance with these specifications. The negative pressure system shall remain in operation during this time. Additional cleaning(s) may be needed as determined by the CPIH/VPIH/CIH.

F. Pre-Clearance Inspection and Testing: The CPIH/CIH and VPIH/CIH will perform a thorough and detailed visual inspection at the end of the cleaning to determine whether there is any visible residue in the regulated area. If the visual inspection is acceptable, the CPIH/CIH will perform pre-clearance sampling using aggressive clearance as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). If the sampling results show values below 0.01 f/cc, then the Contractor shall notify the VA's representative of the results with a brief report from the CPIH/CIH documenting the inspection and sampling results and a

statement verifying that the regulated area is ready for lockdown encapsulation. The VA reserves the right to utilize their own VPIH/CIH to perform a pre-clearance inspection and testing for verification.

G. Lockdown Encapsulation of Abated Surfaces: With the express written permission of the VA's representative, perform lockdown encapsulation of all surfaces from which asbestos was abated in accordance with the procedures in this specification. Negative pressure shall be maintained in the regulated area during the lockdown application.

3.6 FINAL VISUAL INSPECTION AND AIR CLEARANCE TESTING

A. General: Notify the VA representative 24 hours in advance for the performance of the final visual inspection and testing. The final visual inspection and testing will be performed by the VPIH/CIH starting after the final cleaning.

B. Final Visual Inspection: Final visual inspection will include the entire regulated area, the PDF, all poly sheeting, seals over HVAC openings, doorways, windows, and any other openings. If any debris, residue, dust or any other suspect material is detected, the final cleaning shall be repeated at no additional cost to the VA. Dust/material samples may be collected and analyzed at no additional cost to the VA at the discretion of the VPIH/CIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

C. Final Air Clearance Testing:

1. After an acceptable final visual inspection by the VPIH/CIH and VA Representative, the VPIH/CIH will perform the final clearance testing. Air samples will be collected and analyzed in accordance with procedures for AHERA in this specification. If work is less than 260 lf/160 sf/35 cf, 5 PCM samples shall be collected for clearance and a minimum of two field blank. If work is equal to or more than 260 lf/160 sf/35 cf, AHERA TEM sampling shall be performed for clearance. TEM analysis shall be done in accordance with procedures for EPA AHERA presented in this specification. If the release criteria are not met, the Contractor shall repeat the final cleaning and continue decontamination procedures until clearance is achieved. **All Additional inspection and testing costs will be borne by the Contractor.**

2. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

D. Final Air Clearance Procedures:

1. Contractor's Release Criteria: Work in a regulated area is complete when the regulated area is visually clean and airborne fiber levels have been reduced to or below 0.01 f/cc as measured by the AHERA PCM protocol and < 70 AHERA asbestos structures per square millimeter (s/mm2) by AHERA TEM. No averaging of results will be used for this project. All five (5) TEM samples inside the regulated area shall be at or below 70 asbestos s/mm2 to satisfy the project final clearance criteria.
2. Air Monitoring and Final Clearance Sampling: To determine if the elevated airborne fiber counts encountered during abatement operations have been reduced to the specified level, the VPIH/CIH will secure samples and analyze them according to the following procedures:
   a. Fibers Counted: "Fibers" referred to in this section shall be either all fibers regardless of composition as counted in the NIOSH 7400 PCM method or asbestos fibers counted using the AHERA TEM method.
   b. Aggressive Sampling: All final air testing samples shall be collected using aggressive sampling techniques except where soil is not encapsulated or enclosed. Samples will be collected on 0.8µ MCE filters for PCM analysis and 0.45µ MCE for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM clearance samples. Before pumps are started, initiate aggressive air mixing sampling as detailed in 40 CFR 763 Subpart E (AHERA) Appendix A (III)(B)(7)(d). Air samples will be collected in areas subject to normal air circulation away from corners, obstructed locations, and locations near windows, doors, or vents. After air sampling pumps have been shut off, circulating fans shall be shut off. The negative pressure system shall continue to operate.

c. Final clearance for soil that is not encapsulated, samples will be collected on 0.8µ MCE filters for PCM analysis and 0.45µ MCE filters for TEM. A minimum of 3850 Liters of air using calibrated sampling pumps shall be collected for PCM samples and a minimum of 1200 Liters of air using calibrated sampling pumps shall be collected for TEM clearance samples. Air clearance of work areas where contaminated soil has been removed is in addition to the requirement for clearance by bulk sample analysis discussed within these specifications. There will be no aggressive air sampling for the clearance of soil due to the fact that aggressive air sampling may overload the cassettes.

d. Random bulk samples shall be collected from areas of soil which have been abated to ensure that the soil has been properly decontaminated. The total number of samples to be collected from the soil areas shall be; <1000 square feet of soil – 3 samples; >1000 to <5000 square feet of soil – 5 samples; and >5000 square feet of soil – 7 samples. The soil samples shall be collected in a statistically random manner and shall be analyzed by PLM method. The clearance level to determine the soil clean is <1 percent asbestos by weight as analyzed by PLM method. If this level is achieved, the soil areas shall be considered clear. If the levels are >1 percent asbestos, the areas shall be re-cleaned until the sample results are <1 percent.

E. Clearance Sampling Using PCM – Less than 260LF/160SF:

1. The VPIH/CIH will perform clearance samples as indicated by the specification.
2. The NIOSH 7400 PCM method will be used for clearance sampling with a minimum collection volume of 3850 Liters of air. A minimum of 5 PCM clearance samples shall be collected. All samples must be equal to or less than 0.01 f/cc to clear the regulated area.
3. Random bulk samples shall be collected from areas of soil which have been abated to ensure that the soil has been properly decontaminated. The total number of samples to be collected from the soil areas shall be; <1000 square feet of soil – 3 samples; >1000 to <5000 square feet of soil – 5 samples; and >5000 square feet of soil – 7 samples. The soil samples shall be collected in a statistically

random manner and shall be analyzed by PLM method. The clearance level to determine the soil clean is <1 percent asbestos by weight as analyzed by PLM method. If this level is achieved, the soil areas shall be considered clear. If the levels are >1 percent asbestos, the areas shall be re-cleaned until the sample results are <1 percent.

F. Clearance Sampling Using Tem – Equal to or more than 260LF/160SF: TEM
   1. Clearance requires 13 samples be collected; 5 inside the regulated area; 5 outside the regulated area; and 3 field blanks.
   2. The TEM method will be used for clearance sampling with a minimum collection volume of 1200 Liters of air. A minimum of 13 clearance samples shall be collected. All samples must be equal to or less than 70 AHERA structures per square millimeter (s/mm2) AHERA TEM, no averaging of results for this specific project.

G. Laboratory Testing of PCM Clearance Samples: The services of an AIHA accredited laboratory will be employed by the VA to perform analysis for the PCM air samples. The accredited laboratory shall be successfully participating in the AIHA Proficiency Analytical Testing (PAT) program. Samples will be sent daily by the VPIH/CIH so that verbal/faxed reports can be received within 24-36 hours. A complete record, certified by the laboratory, of all air monitoring tests and results will be furnished to the VA’s representative and the Contractor.

H. Laboratory Testing of Tem Samples: Samples shall be sent by the VPIH/CIH to a NIST NVLAP accredited laboratory for analysis by TEM. The laboratory shall be successfully participating in the NIST Airborne Asbestos Analysis (TEM) program. Verbal/faxed results from the laboratory shall be available within 24-36 hours after receipt of the samples. A complete record, certified by the laboratory, of all TEM results shall be furnished to the VA's representative and the Contractor.

I. Laboratory Testing of Bulk Samples: Samples shall be sent by the VPIH/CIH or CPIH/CIH to a NIST NVLAP accredited laboratory for analysis by PLM. The laboratory shall successfully participate in the NIST NVLAP Bulk Asbestos Analysis (PLM) program. Verbal/faxed results from the laboratory shall be available within 24-36 hours after receipt of the

samples. A complete record, certified by the laboratory, of all PLM and/or TEM results shall be furnished to the VA's representative and the Contractor.

3.7 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE

A. Completion of Abatement Work:

1. After thorough decontamination, seal negative air machines with 2 layers of 6-mil poly and duct tape to form a tight seal at the intake/outlet ends before removal from the regulated area. Complete asbestos abatement work upon meeting the regulated area visual and air clearance criteria and fulfilling the following:
   a. Remove all equipment and materials from the project area.
   b. Dispose of all packaged ACM waste as required.
   c. Repair or replace all interior finishes damaged during the abatement work, as required.
   d. Fulfill other project closeout requirements as required in this specification.

B. Certificate of Completion By Contractor: The CPIH/CIH shall complete and sign the "Certificate of Completion" in accordance with Attachment 1 at the completion of the abatement and decontamination of the regulated area.

C. Work Shifts: All work shall generally be done during administrative hours (8:00 AM to 4:30 PM) Monday - Friday excluding Federal Holidays. Any change in the work schedule must be approved in writing by the VA Representative.

D. Re-Insulation: If required as part of the contract, replace all asbestos containing insulation/fire-proofing with suitable non-asbestos material. Provide SDS’s for all replacement materials in advance of installation for VA approval. Refer to Section 23 07 11, HVAC, PLUMBING, AND BOILER PLANT INSULATION.

ATTACHMENT #1
CERTIFICATE OF COMPLETION

DATE: _____ VA Project #: _____

PROJECT NAME: _____ Abatement Contractor: _____

VAMC/ADDRESS: _____

1. I certify that I have personally inspected, monitored and supervised the abatement work of (specify regulated area or Building):
   which took place from / / to / /
2. That throughout the work all applicable requirements/regulations and the VA's specifications were met.
3. That any person who entered the regulated area was protected with the appropriate personal protective equipment and respirator and that they followed the proper entry and exit procedures and the proper operating procedures for the duration of the work.
4. That all employees of the Abatement Contractor engaged in this work were trained in respiratory protection, were experienced with abatement work, had proper medical surveillance documentation, were fit-tested for their respirator, and were not exposed at any time during the work to asbestos without the benefit of appropriate respiratory protection.
5. That I performed and supervised all inspection and testing specified and required by applicable regulations and VA specifications.
6. That the conditions inside the regulated area were always maintained in a safe and healthy condition and the maximum fiber count never exceeded 0.5 f/cc, except as described below.
7. That all abatement work was done in accordance with OSHA requirements and the manufacturer’s recommendations.

CPIH/CIH Signature/Date: _____

CPIH/CIH Print Name: _____

Abatement Contractor Signature/Date: _____

Abatement Contractor Print Name: _____

ATTACHMENT #2
CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME: _____ DATE: _____

PROJECT ADDRESS: _____

ABATEMENT CONTRACTOR'S NAME: _____

WORKING WITH ASBESTOS CAN BE HAZARDOUS TO YOUR HEALTH. INHALING ASBESTOS HAS BEEN LINKED WITH VARIOUS TYPES OF CANCERS. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, YOUR CHANCES OF DEVELOPING LUNG CANCER IS GREATER THAN THAT OF THE NON-SMOKING PUBLIC.

Your employer's contract with the owner for the above project requires that: You must be supplied with the proper personal protective equipment including an adequate respirator and be trained in its use. You must be trained in safe and healthy work practices and in the use of the equipment found at an asbestos abatement project. You must receive/have a current medical examination for working with asbestos. These things shall be provided at no cost to you. By signing this certificate of worker's acknowledgement you are indicating to the owner that your employer has met these obligations.

RESPIRATORY PROTECTION: I have been trained in the proper use of respirators and have been informed of the type of respirator to be used on the above indicated project. I have a copy of the written Respiratory Protection Program issued by my employer. I have been provided for my exclusive use, at no cost, with a respirator to be used on the above indicated project.

TRAINING COURSE: I have been trained by a third party, State/EPA accredited trainer in the requirements for an AHERA/OSHA Asbestos Abatement Worker training course, 32-hours minimum duration. I currently have a valid State accreditation certificate. The topics covered in the course include, as a minimum, the following:

- Physical Characteristics and Background Information on Asbestos
- Potential Health Effects Related to Exposure to Asbestos
- Employee Personal Protective Equipment
- Establishment of a Respiratory Protection Program
- State of the Art Work Practices
- Personal Hygiene
- Additional Safety Hazards
- Medical Monitoring
- Air Monitoring
- Relevant Federal, State and Local Regulatory Requirements, Procedures, and Standards
- Asbestos Waste Disposal

MEDICAL EXAMINATION: I have had a medical examination within the past 12 months which was paid for by my employer. This examination included: health history, occupational history, pulmonary function test, and may have included a chest x-ray evaluation. The physician issued a positive written opinion after the examination.

Signature: _____

Printed Name: _____

Social Security Number:_____

Witness:_____

ATTACHMENT #3
AFFIDAVIT OF MEDICAL SURVEILLANCE, RESPIRATORY PROTECTION AND TRAINING/ACCREDITATION

VA PROJECT NAME AND NUMBER:_____

VA MEDICAL FACILITY:_____

ABATEMENT CONTRACTOR'S NAME AND ADDRESS:_____

1. I verify that the following individual

Name:_____ Social Security Number:_____

who is proposed to be employed in asbestos abatement work associated with the above project by the named Abatement Contractor, is included in a medical surveillance program in accordance with 29 CFR 1926.1101(m), and that complete records of the medical surveillance program as required by 29 CFR 1926.1101(m)(n) and 29 CFR 1910.20 are kept at the offices of the Abatement Contractor at the following address.

Address:_____

2. I verify that this individual has been trained, fit-tested and instructed in the use of all appropriate respiratory protection systems and that the person is capable of working in safe and healthy manner as expected and required in the expected work environment of this project.

3. I verify that this individual has been trained as required by 29 CFR 1926.1101(k). This individual has also obtained a valid State accreditation certificate. Documentation will be kept on-site.

4. I verify that I meet the minimum qualifications criteria of the VA specifications for a CPIH.

Signature of CPIH/CIH:_____ Date:_____

Printed Name of CPIH/CIH:_____

Signature of Contractor:_____ Date:_____

Printed Name of Contractor:_____

ATTACHMENT #4
ABATEMENT CONTRACTOR/COMPETENT PERSON(S) REVIEW AND ACCEPTANCE OF THE VA'S ASBESTOS SPECIFICATIONS

VA Project Location:_____

VA Project #:_____

VA Project Description:_____

1. This form shall be signed by the Asbestos Abatement Contractor Owner and the Asbestos Abatement Contractor's Competent Person(s) prior to any start of work at the VA related to this Specification. If the Asbestos Abatement Contractor's/Competent Person(s) has not signed this form, they shall not be allowed to work on-site.

2 I, the undersigned, have read VA's Asbestos Specification regarding the asbestos abatement requirements. I understand the requirements of the VA's Asbestos Specification and agree to follow these requirements as well as all required rules and regulations of OSHA/EPA/DOT and State/Local requirements. I have been given ample opportunity to read the VA's Asbestos Specification and have been given an opportunity to ask any questions regarding the content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of the VA's Asbestos Specification.

3. At the conclusion of the asbestos abatement, I will certify that all asbestos abatement work was done in accordance with the VA's Asbestos Specification and all ACM was removed properly and no fibrous residue remains on any abated surfaces.

Abatement Contractor Owner's Signature_____Date_____

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DIVISION 03
CONCRETE

01-01-21

SECTION 03 30 53
(SHORT FORM) CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place structural concrete.
2. Slab on grade infill.
3. Suspended slab infill on metal deck.
4. Foundation wall infill.
5. Equipment pads.
6. Preparation of existing surfaces to receive concrete.
7. Preparation of existing surface to received concrete topping.

1.2 RELATED WORK

A. Section 01 45 29, TESTING LABORATORY SERVICES: Materials Testing and Inspection During Construction.
B. Section 07 11 13, BITUMINOUS DAMPPROOFING: Bituminous Dampproofing.
C. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS
D. Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS: Concrete Roads, Walks, and Similar Exterior Site Work.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.
B. American Concrete Institute (ACI):

117-10(R2015).....Specification for Tolerances for Concrete Construction and Materials and Commentary
211.1-91(R2022).....Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.
211.2-98(R2004).....Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
301/301M-20.....Specifications for Structural Concrete.
305.1-14 - .....Hot Weather Concreting.
306.1-90(R2002).....Cold Weather Concreting.
318/318M-22.....Building Code Requirements for Structural Concrete and Commentary

01-01-21

347R-14 - 21.....Guide to Formwork for Concrete.

SP-66-04-.....ACI Detailing Manual.

C. ASTM International(ASTM):

A615/A615M-24.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

A996/A996M-24.....Standard Specification for Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement

A1064/A1064M-24.....Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

C33/C33M-24a.....Standard Specification for Concrete Aggregates.

C39/C39M-24.....Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

C94/C94M-24c.....Standard Specification for Ready-Mixed Concrete.

C143/C143M-20.....Standard Test Method for Slump of Hydraulic Cement Concrete.

C150/C150M-24.....Standard Specification for Portland Cement.

C171-20.....Standard Specification for Sheet Materials for Curing Concrete.

C192/C192M-24.....Standard practice for Making and Curing Concrete Test Specimens in the Laboratory.

C219-24.....Standard Terminology Relating to Hydraulic and Other Inorganic Cements.

C260/C260M-23.....Standard Specification for Air-Entraining Admixtures for Concrete.

C330/C330M-23.....Standard Specification for Lightweight Aggregates for Structural Concrete.

C494/C494M-24.....Standard Specification for Chemical Admixtures for Concrete.

C618-23 .....Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

C881/C881M-20a .....Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

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C989/C989M-24 .....Standard Specification for Slag Cement for Use in Concrete and Mortars.

C1240-20 .....Standard Specification for Silica Fume Used in Cementitious Mixtures.

D1751-23 .....Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

E1155-23.....Determining FF Floor Flatness and FL Floor Levelness Numbers.

E1745-17 .....Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.

D. International Concrete Repair Institute:

310.2R-2013 -.....Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.4 SUBMITTALS

A. Submittal Procedures: Refer to Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer’s Representative (COR) review and approval.

B. Submittal Drawings:

1. Submit large scale drawings of reinforcing steel, including all reinforcing bend diagrams and reinforcing details, to the COR for review and approval.

C. Manufacturer's Literature and Data:

1. Concrete Mix Design.
2. Air-entraining admixture, chemical admixtures, and curing compounds.
3. Indicate manufacturer's recommendation for each application.

D. Certificates: Certify products comply with specifications.

1. Each ready mix concrete batch delivered to site.

1.5 DELIVERY

A. Deliver each ready-mixed concrete batch with mix certification in duplicate according to ASTM International(ASTM) C94/C94M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I or II.

B. Pozzolans:

1. Fly Ash: ASTM International(ASTM) C618, Class C or F including supplementary optional physical requirements. Pozzolans shall not exceed 25 percent of total cementitious materials by weight.
2. Slag: ASTM International(ASTM) C989/C989M; Grade 100.
   Silica Fume: ASTM International(ASTM) C1240.

C. Coarse Aggregate: ASTM International(ASTM) C33/C33M.

1. Size 467 for footings and walls over 300 mm (12 inches) thick.
2. Size 7 for coarse aggregate for applied topping and metal pan stair fill.
3. Size 67 for other applications.

D. Fine Aggregate: ASTM International(ASTM) C33/C33M.

E. Lightweight Aggregate for Structural Concrete:
ASTM International(ASTM) C330/C330M, Table 1.

F. Mixing Water: Fresh, clean, and potable.

G. Air-Entraining Admixture: ASTM International(ASTM) C260/C260M.

H. Chemical Admixtures: ASTM International(ASTM) C494/C494M.

I. Vapor Barrier: ASTM International(ASTM) E1745, Class A with a minimum puncture resistance of 2200 g (3000 pounds); minimum 0.38 mm (15 mil) thick.

J. Reinforcing Steel: ASTM International(ASTM) A615/A615M or ASTM International(ASTM) A996/A996M, deformed. See Structural Drawings for grade.

K. Forms: Wood, plywood, metal, or other materials, approved by Contracting Officer, of grade or type suitable to obtain type of finish specified.

1. Plywood: Exterior grade, free of defects and patches on contact surface.

2. Lumber: Sound, grade-marked, S4S stress graded softwood.

3. Form coating: As recommended by Contractor.

L. Welded Wire Fabric: ASTM International(ASTM) A1064/A1064M, plain; Grade 65; sized as indicated.

M. Expansion Joint Filler: ASTM International(ASTM) D1751.

N. Sheet Materials for Curing Concrete: ASTM International(ASTM) C171.

O. Abrasive Aggregates: Aluminum oxide grains or emery grits.

P. Liquid Densifier/Sealer: 100 percent active colorless aqueous siliconate solution.

Q. Grout, Non-Shrinking: Premixed ferrous or non-ferrous. Grout to show no settlement or vertical drying shrinkage at 3 days. Compressive strength for grout, at least 18 MPa (2500 psi) at 3 days and 35 MPa (5000 psi) at 28 days.

2.2 ACCESSORIES

A. Bonding Agent: ASTM International (ASTM) C 1059/C 1059M, Type II.

B. Structural Adhesive: ASTM International (ASTM) C881, 2-component material suitable for use on dry or damp surfaces. Provide material Type, Grade, and Class to suit Project requirements.

C. Water Stops: Rubber base with self-healing properties. Expanding clay based products not acceptable.

D. Weeps: Geotextile type as recommended by Contractor and approved by the COR.

2.3 CONCRETE MIXES

A. Design concrete mixes according to ASTM International (ASTM) C94/C94M, Option C.

B. Compressive strength at 28 days: minimum 30 MPa (4,000 psi).

C. Submit mix design and results of compression tests to the Contracting Officer for his evaluation. Identify all materials, including admixtures, making-up the concrete.

D. Maximum Slump for Vibrated Concrete: 100 mm (4 inches) tested according to ASTM International (ASTM) C143.

E. Cement and Water Factor (See Table I):

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE				
Concrete: Strength	Non-Air-Entrained		Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/cu. m (lbs./cu. yd.)	Max. Water Cement Ratio	Min. Cement kg/cu. m (lbs./cu. yd.)	Max. Water Cement Ratio
35 (5000)1,3	375 (630)	0.45	385 (650)	0.40
30 (4000)1,3	325 (550)	0.55	340 (570)	0.50
25 (3000)1,3	280 (470)	0.65	290 (490)	0.55
25 (3000)1,2	300 (500)	See 4 Below	310 (520)	See 4 Below

Notes:

1. If trial mixes are used, achieve a compressive strength 8.3 MPa (1 200 psi) in excess of f'c. For concrete strengths greater than 35 MPa (5,000 psi), achieve a compressive strength 9.7 MPa (1,400 psi) in excess of f'c.
2. Lightweight Structural Concrete: Pump mixes may require higher cement values as specified in ACI 318/318M.
3. For Concrete Exposed to High Sulfate Content Soils: Maximum water cement ratio is 0.44.
4. Laboratory Determined according to ACI 211.1 for normal weight concrete or ACI 211.2 for lightweight structural concrete.

F. Air-entrainment as specified, and conform with the following for air content table:

TABLE II - TOTAL AIR CONTENT FOR VARIOUS SIZES OF COARSE AGGREGATES	
Nominal Maximum Size of Coarse Aggregate	Total Air Content, percent
10 mm (3/8 inches)	6 Moderate exposure; 7.5 severe exposure
13 mm (1/2 inches)	5.5 Moderate exposure; 7 severe exposure
19 mm (3/4 inches)	5 Moderate exposure; 6 severe exposure
25 mm (1 inches)	4.5 Moderate exposure; 6 severe exposure
40 mm (1 1/2 inches)	4.5 Moderate exposure; 5.5 severe exposure

2.4 BATCHING AND MIXING

A. Store, batch, and mix materials according to ASTM C94/C94M.

1. Job-Mixed: Batch mix concrete in stationary mixers as specified in ASTM International(ASTM) C94/C94M.
2. Ready-Mixed Concrete: Comply with ASTM International(ASTM) C94/C94M, except use of non-agitating equipment for transporting concrete to Site is not acceptable.
3. EXECUTION Mixing Structural Lightweight Concrete: Charge mixer with 2/3 of total mixing water and total aggregate for each batch. Mix ingredients minimum 30 seconds in stationary mixer or minimum 10 revolutions at mixing speed in truck mixer. Add remaining mixing water and other ingredients and continue mixing. Above procedure may be modified as recommended by aggregate producer.
4. When aggregate producer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

PART 3 - EXECUTION

3.1 FORMWORK

A. Installation: Conform to ACI 347. Construct forms to obtain concrete of the shapes, dimensions and profiles indicated, with tight joints.

B. Design and construct forms to prevent bowing-out of forms between supports and to be removable without prying against or otherwise damaging fresh concrete.

C. When patching formed concrete, seal form edges against existing surface to prevent leakage; set forms so that patch is flush with adjacent surfaces.

D. Treating and Wetting: Treat or wet concrete contact surfaces:
   1. Coat plywood and lumber forms with non-staining form sealer.
   2. Wet wood forms thoroughly when they are not treated with form release agent.
   3. Prevent water from accumulating and remaining within forms.
   4. Clean and coat removable metal forms with light form oil before reinforcement is placed.
   5. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
   6. Prevent water from accumulating and remaining within forms.

E. Inserts, Sleeves, and Similar Items: Install flashing reglets, masonry ties, anchors, inserts, wires, hangers, sleeves, boxes for floor hinges, and other cast-in items specified in other Sections. Place where indicated, square, flush and secured to formwork.

F. Construction Tolerances - General: Install and maintain concrete formwork to assure completion of work within specified tolerances.

G. Adjust or replace completed work exceeding specified tolerances before placing concrete.

3.2 REINFORCEMENT

A. Install concrete reinforcement according to ACI 318 and ACI SP-66.

B. Support and securely tie reinforcing steel to prevent displacement during placing of concrete.

C. Drilling for Dowels in Existing Concrete: Use sharp bits, drill hole slightly oversize, fill with epoxy grout, inset the dowel, and remove excess epoxy.

3.3 VAPOR BARRIER

A. Except where membrane waterproofing is required, place interior concrete slabs on a continuous vapor barrier.

B. Lap joints 150 mm (6 inches) and seal with a compatible pressure-sensitive tape.

C. Patch punctures and tears.

3.4 PLACING CONCRETE

A. Remove water from excavations before concrete is placed. Remove hardened concrete, debris and other foreign materials from interior of forms, and from inside of mixing and conveying equipment. Obtain approval from Contracting Officer's Representative before placing concrete.

B. Install screeds at required elevations for concrete slabs.

C. Roughen and clean free from laitance, foreign matter, and loose particles before placing new concrete on existing concrete.

1. Blow-out areas with compressed air and immediately coat contact areas with adhesive in compliance with manufacturer's instructions.

D. Place structural concrete according to ACI 301 and ACI 318.

E. Convey concrete from mixer to final place of deposit by method that will prevent segregation or loss of ingredients. Do not deposit, in

Work, concrete that has attained its initial set or has contained its water or cement more than 1 1/2 hours. Do not allow concrete to drop freely more than 1500 mm (5 feet) in unexposed work nor more than 900 mm (3 feet) in exposed work.

F. Place and consolidate concrete in horizontal layers not exceeding 300 mm (12 inches) in thickness. Consolidate concrete by spading, rodding, and mechanical vibrator. Do not secure vibrator to forms or reinforcement. Continuously vibrate during placement of concrete.

G. Concrete Fill in Stair Tread and Landing Pans: Coat steel with bonding agent and fill pans with concrete. Reinforce with 2 inch by 2 inch by 1.6 mm (0.06 inch) welded wire mesh at midpoint.

H. Hot Weather Concrete Placement: As recommended by ACI 305.1 to prevent adversely affecting properties and serviceability of hardened concrete.

I. Cold Weather Concrete Placement: As recommended by ACI 306.1, to prevent freezing of thin sections less than 300 mm (12 inches) and to permit concrete to gain strength properly.

1. Do not use calcium chloride without written approval from Contracting Officer's Representative.

3.5 TOLERANCES

A. Slab on Grade Finish Tolerance: Comply with ACI 117, FF-number and FL-number method.

1. Paragraph 4.8.3, Class A 3 mm (1/8 inches) for offset in form-work.
2. Table R4.8.4, "Flat" 6 mm (1/4 inch) in 3 m (10 feet) for slabs.

3.6 PROTECTION AND CURING

A. Protect exposed surfaces of concrete from premature drying, wash by rain or running water, wind, mechanical damage, and excessive hot or cold temperatures.

B. Curing Methods: Cure concrete with curing compound using wet method with sheets.

C. Formed Concrete Curing: Wet the tops and exposed portions of formed concrete and keep moist until forms are removed.

1. If forms are removed before 14 days after concrete is cast, install sheet curing materials as specified above.

D. Concrete Flatwork Curing:

1. Install sheet materials according to the manufacturer's instructions.
   a. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.7 FORM REMOVAL

A. Maintain forms in place until concrete is self-supporting, with construction operation loads.

B. Remove fins, laitance and loose material from concrete surfaces when forms are removed. Repair honeycombs, rock pockets, sand runs, spalls, or otherwise damaged surfaces by patching with the same mix as concrete minus the coarse aggregates.

C. Finish to match adjacent surfaces.

3.8 FINISHES

A. Vertical and Overhead Surface Finishes:
   1. Surfaces Concealed in Completed Construction: As-cast; no additional finishing required.
   2. Surfaces Exposed in Unfinished Areas: As-cast; no additional finishing required.
      a. Mechanical rooms.
      b. Electrical rooms.
   3. Surfaces Exposed to View Scheduled for Paint Finish: Remove fins, burrs and similar projections by mechanical means approved by Contracting Officer's Representative flush with adjacent surface. Lightly rub with fine abrasive stone or hone. Use ample amount of water during rubbing without working up a lather of mortar or changing texture of concrete.
   4. Surfaces Exposed to View in Finished Areas: Grout finish, unless otherwise shown, for uniform color and smooth finish treated.
      a. Remove laitance, fins and burrs.
      b. Scrub concrete with wire brushes. Clean stained concrete surfaces with hone or stone.
      c. Apply grout composed of 1 part Portland cement and 1 part clean, fine sand (smaller than 600 micro-m (No. 30) sieve). Work grout

into surface of concrete with cork floats or fiber brushes until pits and honeycomb are filled.

d. After grout has hardened, but is still plastic, remove surplus grout with sponge rubber float and by rubbing with clean burlap.

e. In hot, dry weather fog spray surfaces with water to keep grout wet during setting period. Complete finished areas in same day. Confine limits of finished areas to natural breaks in wall surface. Do not leave grout on concrete surface overnight.

B. Slab Finishes:

1. Allow bleed water to evaporate before surface is finished. Do not sprinkle dry cement on surface to absorb water.

2. Scratch Finish: Rake or wire broom after partial setting slab surfaces to received bonded applied cementitious application, within 2 hours after placing, to roughen surface and provide permanent bond between base slab and applied cementitious materials.

3. Float Finish: Interior ramps, interior stair treads, and platforms, both equipment pads, and slabs to receive non-cementitious materials, except as specified.

a. Screen and float to smooth dense finish.

b. After first floating, while surface is still soft, check surfaces for alignment using straightedge or template. Correct high spots by cutting down with trowel or similar tool. Correct low spots by filling in with material same composition as floor finish. Remove any surface projections on floated finish by rubbing or dry grinding. Refloat slab to uniform sandy texture.

4. Steel Trowel Finish: Applied toppings, concrete surfaces to receive resilient floor covering or carpet, future floor roof and other monolithic concrete floor slabs exposed to view without other finish indicated or specified.

a. Delay final steel troweling to secure smooth, dense surface, usually when surface can no longer be dented by fingers. During final troweling, tilt steel trowel at slight angle and exert heavy pressure on trowel to compact cement paste and form dense, smooth surface.

b. Finished surface: Free from trowel marks. Uniform in texture and appearance.

5. Broom Finish: Finish exterior slabs, ramps, and stair treads with bristle brush moistened with clear water after surfaces have been floated.
6. Finished Slab Flatness (FF) and Levelness (FL):
   a. Slab on Grade: Specified overall value FF 25/FL 20. Minimum local value FF 17/FL 15.
   b. Test flatness and levelness according to ASTM E1155.

3.9 SURFACE TREATMENTS

A. Mix and apply the following surface treatments according to manufacturer's instructions.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Liquid Densifier/Sealer: Use for exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.

C. Slip Resistant Finish:
   1. Except where safety nosing and tread coverings are shown, apply abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms.
      a. Broadcast aggregate uniformly over concrete surface. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water sufficiently to slightly expose abrasive aggregate.

3.10 APPLIED TOPPING

A. Install concrete topping with thickness and strength shown with only enough water to ensure stiff, workable, plastic mix.

B. Continuously place applied topping until entire area is complete, struck off with straightedge, compact by rolling or tamping, float and steel trowel to hard smooth finish.

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3.11 RESURFACING FLOORS

A. Remove existing flooring by abrasive blasting or grinding, in areas to receive resurfacing, to expose existing structural slab. Achieve a surface profile of 2 to 4 according to ICRI 310.2R for the condition found at Site.

B. Prepare exposed structural slab surface by cleaning, wetting, and applying adhesive according to manufacturer's instructions as specified in the flooring section.

3.12 FOUNDATION WALL INFILL

A. Install air-entrained concrete at foundation wall infill, as indicated.

B. Install expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves, as indicated.

C. Finish exposed surfaces to match adjacent concrete surfaces, new or existing.

D. Place porous backfill, as indicated on Drawings.

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DIVISION 04
MASONRY

SECTION 04 01 00
MAINTENANCE OF MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Repointing existing masonry joints.
2. Replacing existing masonry units.

1.2 RELATED WORK

A. Section 04 05 13, MASONRY MORTARING: Mortars for new masonry.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

C67/C67M-21.....Sampling and Testing Brick and Structural Clay Tile.

C144-24.....Aggregate for Masonry Mortar.

C150/C150M-24.....Specification for Portland Cement.

C207-24 - .....Hydrated Lime for Masonry Purposes

C216-24 - .....Facing Brick (Solid Masonry Units Made from Clay or Shale)

C270-19ae1.....Mortar for Unit Masonry

C295/C295M-19.....Petrographic Examination of Aggregates for Concrete

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Replacement units indicating manufacturer recommendation for each application.

C. Samples:

1. Pointing Mortar: Molded, 150 mm (6 inches) long for each type, texture, and color.

D. Test reports:
   1. Preconstruction test results of existing masonry mortar and units.
   2. Recommended mortar mix and mortar materials sources.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Documented experience in completion of work, similar in design, material, and extent specified.

B. Preconstruction Testing:
   1. Existing Brick: according to ASTM C67.
   2. Existing Mortar: according to ASTM C295/C295M.
      a. Recommend mortar mix compatible with existing and mortar material sources required to match existing color and texture.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store materials covered, protected from weather, and elevated above grade.
   1. Prevent contamination of aggregates.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
   1. Cold Weather Requirements: Maintain mortar ingredients and substrate within temperature range between 4 degrees C (40 degrees F) and 49 degrees C (120 degrees F) when outside temperature is less than 4 degrees C (40 degrees F).
   2. Hot Weather Requirements: Protect mortar-joint from evaporation of moisture from mortar material. When required, provide adequately shaded work area.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Mortar Components:

1. Hydrated Lime: ASTM C207, Type S.
2. Aggregate: ASTM C144.
3. Portland Cement: ASTM C150/C150M, Type I.
4. Water: Potable, free of substances that are detrimental to grout, masonry, and metal.

2.2 PRODUCTS - GENERAL

A. Basis of Design: As shown on drawings.

B. Provide each product from one manufacturer and from one production run .

2.3 REPLACEMENT MASONRY UNITS

A. Face Brick:

1. ASTM C216, Grade SW, Type FBS, matching existing .
2. Efflorescence: Rated slight efflorescent when tested according to ASTM C67.

B. Other Masonry Units: Match existing.

2.4 MIXES

A. Tuck Pointing Mortar: ASTM C270; Appendix X3.

1. Type N

2.5 ACCESSORIES

A. Cleaning Agent: Soapless, non-acidic, detergent, specially prepared for cleaning brick stone concrete masonry.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.
   1. Protect from mortar droppings and cleaning operations.
C. Remove existing fixtures and fittings concealing masonry joints to permit repointing and repair.

3.2 EXISTING MORTAR JOINTS

A. Cut out existing bed and head mortar joints, to uniform depth of 19 mm (3/4 inches), or to sound mortar without damaging edges and faces of existing masonry units to remain.
B. Remove dust and debris from joints.
   1. Do not rinse when temperature is below freezing.

3.3 TUCK POINTING

A. Dampen joints immediately before tuck pointing. Allow masonry units to absorb surface water.
B. Tightly pack tuck pointing mortar into joints in thin layers, 6 mm (1/4 inch) thick, maximum.
C. Allow layer to become slightly hardened before applying next layer.
D. Pack final layer flush with surfaces of masonry units.

3.4 MASONRY UNIT REPLACEMENT

A. Cut out mortar joints surrounding masonry units requiring replacement.
   1. Remove existing masonry units creating opening for replacement masonry unit installation.
   2. Remove mortar, dust, and debris from opening perimeter surfaces.
   3. Prevent debris from falling into cavity.
B. Dampen surfaces of surrounding existing masonry before installing replacement masonry units.
   1. Allow existing masonry to absorb surface moisture before installing replacement units.
   2. Butter contact surfaces of existing masonry and replacement masonry units with mortar.
   3. Center replacement masonry units in opening and press into position.
   4. Remove excess mortar.
   5. Tuck point replacement masonry units to ensure full head and bed joints.

3.5 JOINT TOOLING

A. Tool repointed and replaced masonry joints when mortar becomes slightly hardened.

B. Produce smooth, compacted, concave joint, joint matching existing.

3.6 CLEANING

A. Remove mortar splatter from exposed surfaces immediately.

B. Clean exposed masonry surfaces on completion.

C. Remove mortar droppings and other foreign substances from wall surfaces.

D. Wet surfaces with clean water.

E. Wash with cleaning agent.

F. Brush masonry surfaces with stiff fiber brushes while washing.

G. Immediately after washing, rinse with clean water.

1. Remove traces of detergent, foreign streaks or stains.

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SECTION 04 05 13
MASONRY MORTARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Masonry mortar installed by other, concrete and masonry sections.

1.2 RELATED REQUIREMENTS

A. Mortar used in Section:

1. Section 04 01 00, MAINTENANCE OF MASONRY.
2. Section 04 20 00, UNIT MASONRY.

B. Mortar Color: As shown on drawings.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. C40/C40M-20 - Organic Impurities in Fine Aggregates for Concrete.
2. C91/C91M-23 - Masonry Cement.
3. C144-24 -Aggregate for Masonry Mortar.
4. C150/C150M-24 - Portland Cement.
5. C207-24 - Hydrated Lime for Masonry Purposes.
6. C270-24 - Mortar of Unit Masonry.
7. C595/C595M-24 - Blended Hydraulic Cements.
8. C780-23 - Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
9. C979/C979M-24 - Pigments for Integrally Colored Concrete.
10. C1329/C1329M-23 - Mortar Cement.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.

C. Test Reports: Certify each product complies with specifications.

1. Mortar.
2. Admixtures.

D. Certificates: Certify each product complies with specifications.

1. Portland cement.
2. Masonry cement.
3. Mortar cement.
4. Hydrated lime.
5. Fine aggregate.
6. Color admixture.

E. Qualifications: Substantiate qualifications comply with specifications.
1. Testing laboratory.

1.5 QUALITY ASSURANCE

A. Preconstruction Testing:
1. Engage independent testing laboratory to tests and submit reports.
a. Deliver samples to laboratory in number and quantity required for testing.
2. Test mortar and materials specified.
3. Mortar:
a. Test for compressive strength and water retention according to ASTM C270.
b. Minimum Mortar compressive strengths 28 days:
1) Type M: 17.2 MPa (2,500 psi).
2) Type S: 12.4 MPa (1,800 psi).
3) Type N: 5.1 MPa (750 psi).
4. Non Staining Cement: Test for water soluble alkali.
a. Water Soluble Alkali: Maximum 0.03 percent.
5. Sand: Test for deleterious substances, organic impurities, soundness and grading.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store masonry materials under waterproof covers on planking clear of ground.

1. Protect loose, bulk materials from contamination.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Hydrated Lime: ASTM C207, Type S.

B. Aggregate for Masonry Mortar: 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 and laying of structural facing tile units except that 100 percent passes No. 8 sieve, and maximum 5 percent retained on No. 16 sieve.
3. Test sand for color value according to ASTM C40/C40M. Sand producing color darker than specified standard is unacceptable.

C. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, IP.

D. Masonry Cement: ASTM C91/C91M. Type N, S, Or M.

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

E. Mortar Cement: ASTM C1329/C1329M, Type N, S or M.

F. Portland Cement: ASTM C150/C150M, Type I.

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

G. Pigments: ASTM C979/C979M; inorganic, inert, mineral pigments only, unaffected by atmospheric conditions, nonfading, alkali resistant, and water insoluble.

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

2.2 PRODUCTS - GENERAL

A. Basis of Design: As shown on drawings.

B. Provide each product from one manufacturer and from one production run.

2.3 MIXES

A. Pointing Mortar for New Work:

1. 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. Pointing Mortar for Glazed Structural Facing Tile:
   a. Proportion by volume: One part white Portland cement, two parts of graded white sand passing Number 50 sieve, and 1/8 part hydrated lime.

B. Tuck Pointing Mortar for Repair Work: Tuck pointing mortar specified in Section 04 01 00, MAINTENANCE OF MASONRY.

C. Masonry Mortar: ASTM C270.
1. Admixtures:
   a. Do not use mortar admixtures, and color admixtures unless approved by Contracting Officer's Representative.
   b. Do not use antifreeze compounds.

D. Colored Mortar:
1. Maintain uniform mortar color for exposed work, throughout.
2. Match mortar color in approved sample
3. Alteration Work Mortar Color: Match existing mortar unless specified otherwise in drawings.

E. Color Admixtures:
1. Proportion as specified by manufacturer.
2. For color, see drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

3.2 MIXING

A. Measure ingredients by volume using known capacity container.

B. Mix for 3 to 5 minutes in a mechanically operated mortar mixer.

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 Stiffened Because of Water Loss Through Evaporation:

1. Re-temper by adding water to restore to proper consistency and workability.
2. Discard mortar reaching initial set or unused within two hours of mixing.

E. Pointing Mortar:

1. Mix dry ingredients with enough water to produce damp mixture of workable consistency retaining shape when formed into ball.
2. Allow mortar to stand in dampened condition for 60 to 90 minutes.
3. Add water to bring mortar to a workable consistency before use.

3.3 MORTARING

A. Type S Mortar: Use for masonry containing vertical reinforcing bars (non-engineered).

B. Brick Veneer Over Frame Back Up Walls: Use Type S Portland cement-lime mortar.

C. Type N Mortar: Use for other masonry work.

D. Type N Mortar: Use for pointing items and tuck pointing specified.

3.4 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Take and test samples during progress of work according to ASTM C780.

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SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Concrete masonry unit (CMU) assemblies for:
   1. Exterior walls.
   2. Interior walls and partitions.

1.2 RELATED REQUIREMENTS

A. Sealants and Sealant Installation: Section 07 92 00, JOINT SEALANTS.
B. Color and Texture of Masonry Units: As shown on drawings.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American Concrete Institute (ACI):
   1. 315-17 - Details and Detailing of Concrete Reinforcement.
   2. 530.1/ASCE 6/TMS 602-24 - Specification for Masonry Structures.
C. ASTM International (ASTM):
   1. A615/A615M-24 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
   2. A951/A951M-22 - Steel Wire for Masonry Joint Reinforcement.
   3. A1064/A1064M-24 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   4. C34-13 - Structural Clay Load-Bearing Wall tile.
   5. C55-23 - Concrete Building Brick.
   6. C56-23 - Structural Clay Nonloadbearing Tile.
   7. C62-23 - Building Brick (Solid Masonry Units Made from Clay or Shale).
   8. C67-21 - Sampling and Testing Brick and Structural Clay Tile.
   9. C90-22 - Load-Bearing Concrete Masonry Units.
   10. C126-22 - Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
   11. C216-24 - Facing Brick (Solid Masonry Units Made From Clay or Shale).
   12. C612-19 - Mineral Fiber Block and Board Thermal Insulation.
   13. C744-21 - Prefaced Concrete and Calcium Silicate Masonry Units.

14. D1056-15-(2021) - Flexible Cellular Materials - Sponge or Expanded Rubber.
15. D2240-15-(2021) - Rubber Property-Durometer Hardness.
16. F1667-21 - Driven Fasteners: Nails, Spikes, and Staples.

D. American Welding Society (AWS):
1. D1.4/D1.4M:2018 - Structural Welding Code - Reinforcing Steel.

E. Brick Industry Association (BIA):
1. TN 11B-88 - Guide Specifications for Brick Masonry, Part 3.

F. Federal Specifications (Fed. Spec.):
1. FF-S-107C(2) - Screws, Tapping and Drive.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Fabrication, bending, and placement of reinforcing bars. Comply with ACI 315. Show bar schedules, diagrams of bent bars, stirrup spacing, lateral ties and other arrangements and assemblies.
2. Special masonry shapes, profiles, and placement.
3. Masonry units for typical window and door openings, and, for special conditions as affected by structural conditions.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Installation instructions.

D. 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. Ceramic Glazed Facing 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.
3. Concrete masonry units, when exposed in finish work.
4. Anchors and Ties: Each type.
5. Joint Reinforcing: 1200 mm (48 inches) long each type.

6. Glazed Structural Facing Tile: Clipped panels (triplicate) of four wall units with base units, showing color range, each color and texture.

E. Sustainable Construction Submittals:
   1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

F. Test reports: Certify products comply with specifications.
   1. Ceramic glazed facing brick.

G. Certificates: Certify products comply with specifications.
   1. Face brick.
   2. Solid and load-bearing concrete masonry units, including fire-resistant rated units.
   3. Ceramic glazed facing brick.
   4. Glazed structural clay facing tile.
   5. Structural clay tile units.

H. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.

1.5 QUALITY ASSURANCE

A. Welders and Welding Procedures Qualifications: AWS D1.4/D1.4M.

B. Mockups:
   1. Before starting masonry, build a mockup panel minimum 1800 mm by 1800 mm (6 feet by 6 feet) with 600 mm (24 inch) 90 degree return for outside corner.
      a. Use masonry units from random cubes of units delivered on site.
      b. Include structural backup, reinforcing, ties, and anchors.
   2. Mockup panel approved by Contracting Officer's Representative set workmanship and aesthetic quality for masonry work.
   3. Clean sample panel to test cleaning methods.
   4. Remove mockup panel when directed by Contracting Officer's Representative.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products above grade, protected from contamination.

B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Hot and Cold Weather Requirements: Comply with ACI 530.1/ASCE 6/TMS 602.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.

2.2 PRODUCTS - GENERAL

A. Basis of Design: As shown on drawings.

B. Provide each product from one manufacturer and from one production run.

C. Sustainable Construction Requirements:

1. Concrete Masonry Unit Recycled Content: Select products with recycled content to achieve overall Project recycled content requirement.
2. Steel Recycled Content: 30 percent total recycled content, minimum.

2.3 UNIT MASONRY PRODUCTS

A. Concrete Masonry Units (CMU):

1. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C90.
   a. Unit Weight: Normal weight.

   b. Fire rated units for fire rated partitions.

2. Sizes: Modular, 200 mm by 400 mm (8 inches by 16 inches) nominal face dimension; thickness as indicated on drawings.
3. For molded faces used as a finished surface, use concrete masonry units with uniform fine to medium surface texture unless specified otherwise.
4. Use bullnose concrete masonry units at corners exposed in finished work with 25 mm (1 inch) minimum radius rounded vertical exterior corners (bullnose units).
5. Customized Units:
   a. Sound-Absorbing Units:
      1) Vertical slots in face to core areas.
      2) Acoustical absorption insert: Mineral fiber and metal septum, providing unit with NRC rating of 0.70.
   b. Split-Face Units:N/A
   c. Glazed Face Units: Facing conform to ASTM C744.

2.4 ANCHORS, TIES, AND REINFORCEMENT

A. Steel Reinforcing Bars: ASTM A615/A615M; Grade 60, deformed bars.

B. Joint Reinforcement:
   1. Form from wire complying with ASTM A951/A951M.
   2. Hot dipped galvanized after fabrication.
   3. Width of joint reinforcement 40 mm (1.6 inches) less than nominal thickness of masonry wall or partition.
   4. Cross wires welded to longitudinal wires.
   5. Joint reinforcement minimum 3000 mm (10 feet) long, factory cut.
   6. Joint reinforcement with crimp formed drip is not acceptable.
   7. Maximum spacing of cross wires 400 mm (16 inch) to longitudinal wires.
   8. Ladder Design:
      a. Longitudinal wires deformed 4 mm (0.16 inch) 5 mm (0.20 inch) diameter wire .
      b. Cross wires 2.6 mm (0.10 inch) 4 mm (0.16 inch) diameter .
   9. Trussed Design:
      a. Longitudinal and cross wires minimum 4 mm (0.16 inch nominal) diameter.
      b. Longitudinal wires deformed.

10. 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 minimum 75 mm (3 inches) spaced 400 mm on center (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. Dovetail Anchors:
    1. Corrugated steel dovetail anchors formed of 1.5 mm (0.06 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 minimum 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 (0.02 inch) thick galvanized steel (with felt or fiber filler).

D. Individual Ties:
    1. Rectangular ties: Form from 5 mm (3/16 inch) diameter galvanized steel rod to rectangular shape minimum 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 acceptable.
    2. Adjustable Cavity Wall Ties:
        a. Adjustable wall ties may be furnished 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 rectangular shape 105 mm (4-1/8 inches) wide by length required to extend into bed joint 50 mm (2 inches).
        e. Form other piece to 75 mm (3 inch) long by 75 mm (3 inch) wide shape, having 75 mm (3 inch) long bent section for engaging 105 mm (4-1/8 inch) wide piece to form adjustable connection.

E. Wall Ties, (Mesh or Wire):
   1. Mesh wall ties formed of ASTM A1064/A1064M, W0.5, 2 mm, (0.08 inch) 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, (0.12 inch) galvanized steel wire 50 mm (2 inches) wide by 200 mm (8 inches) long.

2.5 ACCESSORIES

A. 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.

B. Welding Materials: AWS D1.4/D1.4M, type to suit application.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Keep finish work free from mortar smears or spatters, and leave neat and clean.

C. Wall Openings:
   1. Fill hollow metal frames built into masonry walls and partitions solid with mortar as laying of masonry progresses.
   2. When 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 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. Partition Height:
1. Extend partitions minimum 100 mm (4 inches) above suspended ceiling or to overhead construction where no ceiling occurs.
2. Extend following partitions to overhead construction.
   a. Full height partitions, and fire partitions and smoke partitions indicated on drawings.
   b. Both walls at expansion joints.
   c. Corridor walls.
   d. Walls at stairway and stair halls, elevators, dumbwaiters, trash and laundry chute shafts, and other vertical shafts.
   e. Walls at refrigerator space.
   f. Reinforced masonry partitions.
3. Extend finished masonry partitions minimum 100 mm (4 inches) above suspended ceiling and continue with concrete masonry units or structural clay tile to overhead construction:

F. Lintels:
1. Lintels are not required for openings less than 1000 mm (40 inches) wide that have hollow metal frames.
2. Openings 1025 mm (41 inches) wide to 1600 m (63 inches) wide without structural steel lintel or frames, require lintel formed of concrete masonry lintel or bond beam units filled with grout and reinforced with one No. 16 (No. 5) rod top and bottom for each 100 mm (4 inches) of nominal thickness unless shown otherwise.
3. Precast concrete lintels of 25 MPa (3,000 psi) concrete, same thickness as partition, and with one No. 16 (No. 5) deformed bar top and bottom for each 100 mm (4 inches) of nominal thickness, is acceptable in lieu of reinforced CMU masonry lintels.
4. Use steel lintels, for openings greater than 1600 m (63 inches) wide, brick masonry openings, and elevator openings unless shown otherwise.

5. Doors having overhead concealed door closers require steel lintel, and pocket for closer box.
6. Lintel Bearing Length: Minimum 100 mm (4 inches) at both ends.
7. Build masonry openings or arches over wood or metal centering and supports when steel lintels are not used.

G. Wall, Furring, and Partition Units:
1. Lay out field units to provide one-half running bond, unless indicated 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. Minimum Masonry Unit Length: 100 mm (4 inches).
5. On interior partitions provide 6 mm (1/4 inch) open joint for caulking between existing construction, exterior walls, concrete work, and abutting masonry partitions.
6. Use minimum 100 mm (4 inches) nominal thick masonry for free standing furring, unless indicated otherwise.
7. Do not abut existing plastered surfaces except suspended ceilings with new masonry partitions.

H. Use minimum 100 mm (4 inches) nominal thick masonry for fireproofing steel columns unless indicated otherwise.

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

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

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 indicated on drawings. Make sufficiently tight to prevent mortar, grout, or concrete leakage. Brace, tie and support formwork 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 other reasonable temporary construction loads.

N. Minimum Curing Times Before Removing Shores and Forms:
   1. Girders and Beams: 10 days.
   2. Slabs: 7 days.
   3. Reinforced Masonry Soffits: 7 days.

3.2 INSTALLATION - ANCHORAGE

A. 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 400 mm (16 inches) horizontally.
   3. At openings, provide additional ties spaced maximum 900 mm (36 inches) 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 adjustable cavity 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: Install joint reinforcing for multiple wythes and cavity wall ties spaced maximum 400 mm (16 inches) vertically.
   6. Tie interior and exterior wythes of reinforced masonry walls together with individual ties. Provide ties at intervals maximum 400 mm (16 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.

B. 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 (24 inches) 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 adjustable wall ties. Extend ties minimum 100 mm (4 inches) into joints of new masonry. Fasten ties 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.

3.3 INSTALLATION - REINFORCEMENT

A. Joint Reinforcement:

1. Install joint reinforcement in CMU wythe of combination brick and CMU, cavity walls, and single wythe concrete masonry unit walls or partitions.
2. Reinforcing is acceptable in lieu of individual ties for anchoring brick facing to CMU backup in exterior masonry walls.
3. Locate joint reinforcement in mortar joints at 400 mm (16 inch) maximum vertical intervals.
4. 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.

B. Steel Reinforcing Bars:

1. Install reinforcing bars in cells of hollow masonry units where required for vertical reinforcement and in bond beam units for horizontal reinforcement. Install in wall cavities of reinforced masonry walls where indicated on drawings.
2. Bond Beams:
   a. Form Bond beams of load-bearing concrete masonry units filled with grout and reinforced with two No. 15m (No. 5) reinforcing bars unless shown otherwise. Do not cut reinforcement.
   b. Brake bond beams only at expansion joints and at control joints, if shown.
3. Stack Bond:
   a. Locate additional joint reinforcement in vertical and horizontal joints as indicated on drawings.

b. Anchor vertical reinforcement into foundation or wall or bond beam below.
c. Provide temporary bracing for walls over 8 feet tall until permanent horizontal bracing is completed.

4. Grout openings:
a. Leave cleanout holes in double wythe walls during construction by omitting units at base of one side of wall.
b. Locate 75 mm by 75 mm (3 inches. by 3 inches.) min. cleanout holes at location of vertical reinforcement.
c. Keep grout space clean of mortar accumulation and debris. Clean as work progresses and immediately before grouting.

3.4 INSTALLATION - BRICK EXPANSION AND CMU CONTROL JOINTS

A. Provide brick expansion joint (EJ) and CMU control joints (CJ) where indicated on drawings.
B. Keep joint free of mortar and other debris.
C. 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 both sides of shear key.
D. Use standard notched concrete masonry units (sash blocks) made in full and half-length units where shear keys are used to create a continuous vertical joint.
E. Interrupt joint reinforcement at expansion and control joints.
F. Fill opening in exposed face of expansion and control joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.5 INSTALLATION - BUILDING EXPANSION AND SEISMIC JOINTS

A. Keep expansion and seismic joints open and 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. Fill opening in exposed face of expansion and seismic joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.6 INSTALLATION - ISOLATION JOINT

A. Where full height walls and partitions lie parallel or perpendicular to and under structural beams and shelf angles, provide minimum 9 mm (3/8 inch) separation between walls and partitions and bottom of beams and shelf angles.

B. Insert continuous full width strip of non-combustible type compressible joint filler.

C. Fill opening in exposed face of isolation joints with sealant as specified in Section 07 92 00, JOINT SEALANTS.

3.7 INSTALLATION - BRICKWORK

3.8 INSTALLATION - CONCRETE MASONRY UNITS

A. Types and Uses:

1. Provide special concrete masonry shapes as required. Provide solid concrete masonry units, where full units cannot be installed, or where needed for anchorage of accessories.
2. Provide solid load-bearing concrete masonry units or grout cell of hollow units at jambs of openings in walls, where structural members impose loads directly on concrete masonry, and where shown.
3. Provide rounded corner (bullnose) shapes at opening jambs in exposed work and at exterior corners.
4. Do not install brick jambs in exposed finish work.
5. Install concrete building brick only as filler in backup material where not exposed.
6. Construct fire resistance in fire rated partitions meeting fire ratings indicated on drawings.
7. Structural Clay Tile Units (Option):
   a. Structural clay tile units load-bearing or non-load bearing as required, may be installed in lieu of concrete masonry units, only, but not as an exposed surface, foundation walls or where otherwise noted.
   b. Set units as specified for concrete masonry units.
   c. Install brick or load-bearing structural clay tile units, with cores set vertically, and filled with grout where structural members impose concentrated load directly on structural clay tile masonry.

8. Where lead-lined concrete masonry unit partitions terminate below underside of overhead floor or roof deck, fill remaining open space between top of partition and underside of overhead floor or roof deck, with standard concrete masonry units of same thickness as lead lined units.

B. Laying:

1. Lay concrete masonry units with 9 mm (3/8 inch) joints, with a bond overlap of minimum 1/4 of unit length, except where stack bond is indicated on drawings.
2. Do not wet concrete masonry units before laying.
3. Bond external corners of partitions by overlapping alternate courses.
4. Lay first course in a full mortar bed.
5. Set anchorage items as work progress.
6. Where ends of anchors, bolts, and other embedded items, project into voids of units, completely fill voids with mortar or grout.
7. Provide 6 mm (1/4 inch) open joint for sealant between existing construction, exterior walls, concrete work, and abutting masonry partitions.
8. Lay concrete masonry units with full face shell mortar beds and fill head joint beds for depth equivalent to face shell thickness.
9. Lay concrete masonry units so cores of units, that are to be filled with grout, are vertically continuous with joints of cross webs of such cores completely filled with mortar. Unobstructed core openings minimum 50 mm (2 inches) by 75 mm (3 inches).
10. Do not wedge masonry against steel reinforcing. Minimum 13 mm (1/2 inch) clear distance between reinforcing and masonry units.
11. Install deformed reinforcing bars of sizes indicated on drawings.
12. At time of placement, ensure steel reinforcement is free of loose rust, mud, oil, and other contamination capable of affecting bond.
13. Place steel reinforcement at spacing indicated on drawings before grouting.
14. Minimum clear distance between parallel bars: One bar diameter.
15. Hold vertical steel reinforcement in place vertically by centering clips, caging devices, tie wire, or other approved methods.

16. Support vertical bars near each end and at maximum 192 bar diameter on center.
17. Splice reinforcement or attach reinforcement to dowels by placing in contact and securing with wire ties.
18. Stagger splices in adjacent horizontal reinforcing bars. Lap reinforcing bars at splices a minimum of 40 bar diameters.
19. Grout cells of concrete masonry units, containing reinforcing bars, solid as specified.
20. Install cavity and joint reinforcement as masonry work progresses.
21. Rake joints 6 to 10 mm (1/4 to 3/8 inch) deep for pointing with colored mortar when colored mortar is not full depth.

C. Waterproofing Parging:
1. Parge earth side of concrete masonry unit basement walls with mortar applied in two coats, each coat 6 mm (1/4 inch) thick.
2. Clean wall surfaces to receive parging of dirt, oil, or grease, and moisten before application of first coat.
3. Roughen first coat when partially set, permit to hardened for 24 hours, and moisten before application of second coat.
4. Keep second coat damp for minimum 48 hours.
5. Thicken parging and round to form a cove at the junction of outside wall face and footing.

3.9 INSTALLATION - GLAZED STRUCTURAL FACING TILE

3.10 POINTING

A. Fill joints with pointing mortar using rubber float trowel to apply mortar solidly into raked joints.
B. Wipe off excess mortar from joints of glazed masonry units with dry cloth.
C. Tool exposed joints to smooth concave joint.
D. At joints with existing work, match existing joint.

3.11 GROUTING

A. Preparation:
1. Clean grout space of mortar droppings before placing grout.
2. Close cleanouts.

3. Install vertical solid masonry dams across grout space for full height of wall at intervals of maximum 9000 mm (30 feet). Do not bond dam units into wythes as masonry headers.
4. Verify reinforcing bars are installed as indicated on drawings.

B. Placing:
1. Place grout in grout space in lifts as specified.
2. Consolidate each grout lift after free water has disappeared but before plasticity is lost.
3. Do not slush with mortar or use mortar with grout.
4. Interruptions:
a. When grouting must be stopped for more than an hour, top off grout 40 mm (1-1/2 inches) below top of last masonry course.
b. Grout from dam to dam on high lift method.
c. Longitudinal run of masonry may be stopped off only by raking back one-half masonry unit length in each course and stopping grout 100 mm (4 inches) back of rake on low lift method.

C. Puddling Method:
1. Consolidate by puddling with grout stick during and immediately after placing.
2. Grout cores of concrete masonry units containing reinforcing bars solid as masonry work progresses.

D. Low Lift Method:
1. Construct masonry to 1.5 m (5 feet) maximum height before grouting.
2. Grout in one continuous operation and consolidate grout by mechanical vibration and reconsolidate after initial water loss and settlement has occurred.

E. High Lift Method:
1. Do not pour grout until masonry wall has cured minimum of 4 hours.
2. Place grout in 1.5 m (5 feet) maximum lifts.
3. Exception:
a. Where following conditions are met, place grout in 3.86 m (12.67 feet) maximum lifts.
b. Masonry has cured minimum of 4 hours.
c. Grout slump is maintained between 250 and 275 mm (10 and 11 inches).

d. No intermediate reinforced bond beams are placed between top and bottom of grout lift.

4. When vibrating succeeding lifts, extend vibrator 300 to 450 mm (12 to 18 inches) into preceding lift.

3.12 PLACING REINFORCEMENT

A. General: Clean reinforcement of loose rust, mill scale, earth, ice or other materials which will reduce bond to mortar or grout. Do not use reinforcement bars with kinks or bends not shown on drawings or approved submittal drawings, or bars with reduced cross-section due to excessive rusting or other causes.

B. Position reinforcement accurately at spacing indicated on drawings. Support and secure vertical bars against displacement. Install horizontal reinforcement as masonry work progresses. Where vertical bars are shown in close proximity, provide clear distance between bars of minimum one bar diameter or 25 mm (1 inch), whichever is greater.

C. For columns, piers and pilasters, maintain clear distance between vertical bars as indicated on drawings, minimum 1.5 bar diameters or 38 mm (1-1/2 inches), whichever is greater. Provide lateral ties as indicated on drawings.

D. Splice reinforcement bars only where indicated on drawings, unless approved by Contracting Officer's Representative. Provide lapped splices. In splicing vertical bars or attaching to dowels, lap ends, place in contact and wire tie.

E. Provide minimum lap as indicated on approved submittal drawings, or if not indicated, minimum 48 bar diameters.

F. Weld splices where indicated on drawings according to AWS D1.4/D1.4M.

G. Embed metal ties in mortar joints as work progresses, with minimum mortar cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations.

H. Embed prefabricated horizontal joint reinforcement as work progresses, with minimum cover of 15 mm (5/8 inch) on exterior face of walls and 13 mm (1/2 inch) at other locations. Lap joint reinforcement minimum 150 mm (6 inches) at ends. Use prefabricated “L” and “T” sections to provide continuity at corners and intersections. Cut and bend joint

reinforcement for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.

I. Anchoring: Anchor reinforced masonry work to supporting structure as indicated on drawings.

J. Anchor reinforced masonry walls at intersections with non-reinforced masonry.

3.13 INSTALLATION OF REINFORCED BRICK MASONRY

3.14 INSTALLATION OF REINFORCED CONCRETE UNIT MASONRY

A. Do not wet concrete masonry units (CMU).

B. Lay CMU units with full-face shell mortar beds. Fill vertical head joints (end joints between units) solidly with mortar from face of unit to distance behind face equal to thickness of longitudinal face shells. Solidly bed cross-webs of starting courses in mortar. Maintain head and bed 9 mm (3/8 inch) joint widths.

C. Where solid CMU units are shown, lay with full mortar head and bed joints.

D. Walls:

1. Pattern Bond: Lay CMU wall units in 1/2-running bond with vertical joints in each course centered on units in courses above and below, unless otherwise indicated. Bond and interlock each course at corners and intersections. Use special-shaped units where shown, and as required for corners, jambs, sash, control joints, lintels, bond beams and other special conditions.
2. Maintain vertical continuity of core or cell cavities, which are to be reinforced and grouted, to provide minimum clear dimension indicated and to provide minimum clearance and grout coverage for vertical reinforcement bars. Keep cavities free of mortar. Solidly bed webs in mortar where adjacent to reinforced cores or cells.
3. Where horizontally reinforced beams (bond beams) are indicated on drawings, use special units or modify regular units to allow for placement of continuous horizontal reinforcement bars. Place small mesh expanded metal lath or wire screening in mortar joints under bond beam courses over cores or cells of non-reinforced vertical cells, or provide units with solid bottoms.

E. Grouting:

1. Use fine grout for filling spaces less than 100 mm (4 inches) in one or both horizontal directions.
2. Use coarse grout for filling 100 mm (4 inch) spaces or larger in both horizontal directions.
3. Grouting Technique: At Contractor's option, use either low-lift or high-lift grouting techniques.

3.15 CONSTRUCTION TOLERANCES

A. Lay masonry units plumb, level and true to line within tolerances according to ACI 530.1/ASCE 6/TMS 602 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) - 9 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).

3.16 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 detergent solution. Do not use muriatic acid.
   2. Brush with stiff fiber brushes while washing, and immediately wash with clean water.
   3. Remove traces of detergent, foreign streaks, or stains of any nature.

C. Concrete Masonry Units:
   1. Immediately following setting, brush exposed surfaces free of mortar or other foreign matter.
   2. Allow mud to dry before brushing.

D. Glazed Structural Facing Tile or Brick Units:
   1. Clean as recommended manufacturer. Protect light colored mortar joints from discoloration during cleaning.
   2. Use on solid masonry walls.
   3. Prepare schedule of test locations.

3.17 FIELD QUALITY CONTROL

A. Water Penetration Testing:
   1. Seven days before plastering or painting, in presence of Contracting Officer's Representative, test solid exterior masonry walls for water penetration.
   2. Direct water on masonry for a period of one hour when wind velocity is less than five miles per hour.
   3. Should moisture appear on inside of walls tested, make additional tests at other areas as directed by Contracting Officer's Representative.
   4. Correct areas showing moisture on inside of walls, and repeat test at repaired areas, to ensure moisture penetration has been stopped.
   5. Make water test at following locations:
      a. Sixteen places on Building Number 1.
      b. Eight places on other buildings.
      c. At Connecting Corridor make one test for each 45,000 mm (150 lineal feet) of exterior masonry walls.

- - E N D - -

DIVISION 05
METALS

SECTION 05 12 00
STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel shapes, plates, and bars.
2. Structural pipe.
3. Bolts, nuts, and washers.

1.2 RELATED REQUIREMENTS

A. Materials Testing And Inspection During Construction: Section 01 45 29, TESTING LABORATORY SERVICES.

B. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.

C. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.

D. Steel Framing: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.

E. Steel Finishes: As shown on drawings.

F. Steel Support: Section 10 13 00, DIRECTORIES.

G. Painting: Section 09 91 00, PAINTING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Institute of Steel Construction (AISC):

1. AISC Manual - Steel Construction Manual, 14th Ed.
2. 303-22 - Code of Structural Steel Buildings and Bridges.
3. 360-22: Specification for Structural Steel Buildings.

C. The American Society of Mechanical Engineers (ASME):

1. B18.22.1-09 - Washers: Helical Spring-Lock, Tooth Lock, and Plain Washers.

D. American Welding Society (AWS):

1. D1.1/D1.1M:2020 - Structural Welding Code - Steel.

E. ASTM International (ASTM):

1. A6/A6M-24b - General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
2. A36/A36M-19 - Carbon Structural Steel.
3. A53/A53M-24 - Pipe, Steel, Black and Hot-Dip, Zinc-Coated, Welded and Seamless.

4. A123/A123M-24 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
5. A242/A242M-24 - High-Strength Low-Alloy Structural Steel.
6. A283/A283M-24 - Low and Intermediate Tensile Strength Carbon Steel Plates.
7. A307-21 - Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
8. A500/A500M-23 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
9. A501/A501M-21 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing and Rounds and Shapes.
10. A572/A572M-21 - High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
11. A992/A992M-22 - Structural Shapes.
12. F2329/F2329M-15(2003) - Zinc Coating, Hot-Dip, Requirements for Application to Carbon and Alloy steel Bolts, Screws, washers, Nuts, and Special Threaded Fasteners.
13. F3125/F3125M-22 - Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

F. Master Painters Institute (MPI):
   1. No. 18 - Primer, Zinc Rich, Organic.

G. Military Specifications (Mil. Spec.):
   1. MIL-P-21035 - Paint, High Zinc Dust Content, Galvanizing, Repair.

H. Occupational Safety and Health Administration (OSHA):
   1. 29 CFR 1926.752(e) - Guidelines For Establishing The Components Of A Site-Specific Erection Plan.
   2. 29 CFR 1926-2001 - Safety Standards for Steel Erection.

I. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
   1. Specification for Structural Joints Using ASTM F3125 Bolts.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Show size, configuration, and fabrication and installation details.
C. Sustainable Construction Submittals:
   1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
D. Test Reports: Certify products comply with specifications.
   1. Welders' qualifying tests.
E. Certificates: Certify each product complies with specifications.
   1. Structural steel.
   2. Steel connections.
   3. Welding materials.
   4. Shop coat primer paint.
F. Qualifications: Substantiate qualifications comply with specifications.
   1. Fabricator with project experience list.
   2. Installer with project experience list.
   3. Welders and welding procedures.
G. Delegated Design Drawings and Calculations: Signed and sealed by responsible Architect/Engineer.
   1. Connection calculations.
H. Record Surveys: Signed and sealed by responsible surveyor or engineer.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: AISC Quality Certification participant designated as AISC Certified Plant, Category STD.
   1. Regularly fabricates specified products.
   2. Fabricated specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.
B. Installer Qualifications: AISC Quality Certification Program participant designated as AISC-Certified Erector, Category ACSE.
   1. Regularly installs specified products.
   2. Installed specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.

C. Before commencement of Work, ensure steel erector provides written notification required by OSHA 29 CFR 1926.752(e). Submit a copy of the notification to Contracting Officer's Representative.

D. Welders and Welding Procedures Qualifications: AWS D1.1/D1.1M.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where project is located.

B. Design structural steel framing connections complying with specified performance:

1. Load Capacity: Resist full capacity of supported framing member . Account for connection and member loads and eccentricities.
   a. Request additional design criteria when necessary to complete connection design.
2. Configuration: Design and detail all connections for each member size, steel grade and connection type to resist the loads and reactions indicated on the drawings or specified herein. Use details consistent with details shown on drawings, supplementing where necessary. The details shown on 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 Contracting Officer Representative 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 Contracting Officer's Representative. 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.

2.2 MATERIALS

A. W-Shapes:
   1. ASTM A992/A992M.
B. M-Shapes:
   1. ASTM A36/A36M.
C. Channel and Angles:
   1. ASTM A36/A36M.
D. Plates and Bars:
   1. ASTM A36/A36M.
E. Hollow Structural Sections:
   1. ASTM A500/A500M.
   2. ASTM A501/A501M.
F. Structural Pipe: ASTM A53/A53M, Grade B.
G. Bolts, Nuts and Washers: Galvanized for galvanized framing and plain finish for other framing.
   1. High-strength bolts, including nuts and washers: ASTM F3125.
   2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
   3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ASME B18.22.1.
H. Welding Materials: AWS D1.1, type to suit application.

2.3 PRODUCTS - GENERAL

A. Basis of Design: As shown on drawings.
B. Sustainable Construction Requirements:
   1. Steel Recycled Content: 30 percent total recycled content, minimum.
   2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
      a. Paints and coatings.

2.4 FABRICATION

A. Fabricate structural steel according to Chapter M, AISC 360.
B. Shop and Field Connections:
   1. Weld connections according to AWS D1.1/D1.1M. 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.

2. High-Strength Bolts: High-strength bolts tightened to a bolt tension minimum 70 percent 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.

2.5 FINISHES

A. Shop Priming:
   1. Prime paint structural steel according to AISC 303, Section 6.
      a. Interstitial Space Structural Steel: Prime paint, unless indicated to receive sprayed on fireproofing.

B. Shop Finish Painting: Apply primer and finish paint as specified in Section 09 91 00, PAINTING.

C. Do not paint:
   1. Surfaces within 50 mm (2 inches) of field welded joints.
   2. Surfaces indicated to be encased in concrete.
   3. Surfaces receiving sprayed on fireproofing.
   4. Beam top flanges receiving shear connector studs applied.

D. Structural Steel Galvanizing: ASTM A123/A123M, hot dipped, 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.
   1. Galvanize structural steel framing installed at exterior locations.

E. Bolts, Nuts, and Washers Galvanizing: ASTM F2329, hot-dipped.

2.6 ACCESSORIES

A. General: Shop paint steel according to AISC 303, Section 6.

B. Finish Paint System: Primer and finish as specified in Section 09 91 00, PAINTING.

C. Galvanizing Repair Paint: MPI No. 18.

PART 3 - EXECUTION

3.1 ERECTION

A. Erect structural steel according to AISC 303 and AISC 360.

B. Set structural steel accurately at locations and elevations indicated on drawings.

C. Maintain erection tolerances of structural steel within AISC 303 requirements.

1. Pour Stop Elevation Tolerance: 6 mm (1/4 inch), maximum, before concrete placement.

D. Weld and bolt connections as specified for shop connections.

3.2 FIELD PAINTING

A. After welding, clean and prime weld areas to match adjacent finish.

B. Touch-up primer damaged by construction operations.

C. Apply galvanizing repair paint to galvanized coatings damaged by construction operations.

D. Finish Painting: As specified in Section 09 91 00, PAINTING.

3.3 FIELD QUALITY CONTROL

A. Record Survey:

1. Engage registered land surveyor or registered civil engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS to perform survey.

2. Measure and record structural steel framing plumbness, level, and alignment after completing bolting and welding and before installation of work supported by structural steel.

3. Identify deviations from allowable tolerances specified in AISC Manual.

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01-01-21

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 **DESCRIPTION**

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

1. Exterior load-bearing steel stud walls.
2. Interior load-bearing steel stud walls.

1.2 **RELATED WORK**

A. Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS.
B. Section 05 12 00, STRUCTURAL STEEL FRAMING: Structural steel framing.
C. Section 09 22 16, NON-STRUCTURAL METAL FRAMING: Non-load-bearing metal stud framing assemblies.
D. Section 09 29 00, GYPSUM BOARD: Gypsum board assemblies.

1.3 **DESIGN REQUIREMENTS**

A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.

B. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.
1. Design Loads:
a. Gravity, wind and seismic loading as indicated on the drawings or in this specification.
2. Design framing systems to withstand design loads without deflections greater than the following:

a. Exterior Load-Bearing Walls: Lateral deflection of 1/240 of the wall height.
b. Interior Load-Bearing Walls: Lateral deflection of 1/240 of the wall height.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).
4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
5. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
6. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.

1.4 **SUBMITTALS**

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. All items indicated below are required submittals requiring Contracting Officer’s Representative (COR) review and approval

B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.

C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

D. Design of the light gauge for this project shall be provided by the contractor’s structural engineer for the loads shown on the construction documents. Submit signed and sealed calculations performed by a structural engineer with at least 5 years experience in the design of light gauge metal and registered in the state of the project. Calculations shall be submitted with plans elevations and details for review and approval.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 **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 Iron and Steel Institute (AISI): Specification and Commentary for the Design of Cold-Formed Steel Structural Members (2016)

C. ASTM International (ASTM):

A36/A36M-19.....Standard Specification for Carbon Structural Steel

A123/A123M-17.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A153/A153M-24.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A307-21.....Standard Specifications for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength

A653/A653M-23.....Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C955-24.....Standard Specification for Cold Formed Steel Structural Framing Members

C1107/1107M-20.....Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)

E488/E488M-22.....Standard Test Methods for Strength of Anchors in Concrete Elements

E1190-21.....Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

D. American Welding Society (AWS):

D1.3/D1.3M:2018.....Structural Welding Code-Sheet Steel

E. Military Specifications (Mil. Spec.):

MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

F. VA Physical Security and Resiliency Design Manual October 1, 2020.

PART 2 - PRODUCTS

2.1 **MATERIALS**

A. Sheet Steel for joists, studs and accessories 16 gauge and heavier: ASTM A653, structural steel, zinc coated G90, with a yield of 340 MPa (50 ksi) minimum.

B. Sheet Steel for joists, studs and accessories 18 gauge and lighter: ASTM A653, structural steel, zinc coated G90, with a yield of 230 MPa (33 ksi) minimum.

C. Galvanizing Repair Paint: MIL-P-21035B.

D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

2.2 **WALL FRAMING**

A. Steel Studs: Complying with ASTM C 955. Manufacturer’s standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:

1. Minimum Base-Steel Thickness(uncoated): 0.84 mm (0.0329 inch)

2. Flange Width: 1-5/8 inches

3. Web: Punched=.

B. Steel Track: Manufacturer’s standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:

1. Design Uncoated-Steel Thickness: Matching steel studs.
2. Flange Width: Manufacturer’s standard deep flange where indicated, standard flange elsewhere.

2.3 **FRAMING ACCESSORIES**

A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

2.4 **ANCHORS, CLIPS, AND FASTENERS**

A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.

B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.

C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.

E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.5 **REQUIREMENTS**

A. Welding in accordance with AWS D1.3

B. Furnish members and accessories by one manufacturer only.

PART 3 - EXECUTION

3.1 **FABRICATION**

A. Framing components may be preassembled into panels. Panels shall be square with components attached.

B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.

C. Hold members in place until fastened.

D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.

1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer’s instructions with screw penetrating joined members by not less than 3 exposed screw threads.

E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

3.2 **ERECTION**

A. Handle and lift prefabricated panels in a manner as to not distort any member.

B. Securely anchor tracks to supports as shown.

C. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.

D. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

E. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.

F. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.

G. Install headers in all openings that are larger than the stud spacing in that wall.

H. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.

I. Studs in one piece for their entire length, splices will not be permitted.

J. Provide a load distribution member at top track where joist is not located directly over bearing stud.

K. Provide joist bridging and web stiffeners at reaction points where shown.

L. Provide end blocking where joist ends are not restrained from rotation.

M. Provide an additional joist under parallel partitions, unless otherwise shown, when partition length exceeds one-half joist span and when floor and roof openings interrupt one or more spanning members.

N. Provide temporary bracing and leave in place until framing is permanently stabilized.

O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.

P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer’s standard punched openings.

3.3 **TOLERANCES**

A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.

B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.

C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.

D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

3.4 **FIELD REPAIR**

A. Touch-up damaged galvanizing with galvanizing repair paint.

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08-01-18

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.

B. Items specified.

1. Support for Wall and Ceiling Mounted Items: (SD055000-01, SD055000-02, SD102113-01, SD102600-01, SD123100-01 & SD123100-02)
2. Frames:
3. Guards
6. Loose Lintels
7. Shelf Angles
9. Plate Door Sill
10. Safety Nosings
12. Railings:
15. Sidewalk Access Doors
16. Screened Access Doors
17. Steel Counter or Bench Top Frame and Leg
18. Steel Pipe Bollards

1.2 RELATED WORK

A. Railings attached to steel stairs: Section 05 51 00, METAL STAIRS.

B. Colors, finishes, and textures: As shown on drawings.

C. Prime and finish painting: Section 09 91 00, PAINTING.

D. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:

Grating, each type	Floor plate

Trap door	Wheel guards
Ceiling hatch	Sidewalk Access door
Manhole Covers	Safety nosing

C. Shop Drawings:
   1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
   2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.
   3. Provide templates and rough-in measurements as required.

D. Manufacturer's Certificates:
   1. Anodized finish as specified.
   2. Live load designs as specified.

E. Design Calculations for specified live loads including dead loads.

F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete and masonry work, and for the positioning of items having anchors to be built into concrete or masonry construction.

1.4 QUALITY ASSURANCE

A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.

B. Each product type shall be the same and be made by the same manufacturer.

C. Assembled product to the greatest extent possible before delivery to the site.

D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

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. American Society of Mechanical Engineers (ASME):

B18.6.1-R2016.....Wood Screws

B18.2.2-R2022.....Square and Hex Nuts

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

A36/A36M-19.....Structural Steel

A47-22.....Malleable Iron Castings

A48-22.....Gray Iron Castings

A53-24.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless

A123-24.....Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

A240/A240M-24.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A269-24.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A307-21.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength

A391/A391M-21.....Grade 80 Alloy Steel Chain

A786/A786M-21.....Rolled Steel Floor Plate

B221-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B456-22.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium

B632-24.....Aluminum-Alloy Rolled Tread Plate

C1107-20.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

D3656-21.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

F436-24.....Hardened Steel Washers

F468-23.....Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws and Studs for General Use

F593-24.....Stainless Steel Bolts, Hex Cap Screws, and Studs

F1667-21a.....Driven Fasteners: Nails, Spikes and Staples

D. American Welding Society (AWS):

D1.1-20.....Structural Welding Code Steel

D1.2-14.....Structural Welding Code Aluminum

D1.3-18.....Structural Welding Code Sheet Steel

E. National Association of Architectural Metal Manufacturers (NAAMM)

AMP 521-01(R2012).....Pipe Railing Manual

AMP 500-06.....Metal Finishes Manual

MBG 531-24.....Metal Bar Grating Manual

MBG 532-24.....Heavy Duty Metal Bar Grating Manual

F. Structural Steel Painting Council (SSPC)/Society of Protective Coatings:

SP 1-15.....No. 1, Solvent Cleaning

SP 2-24.....No. 2, Hand Tool Cleaning

SP 3-18.....No. 3, Power Tool Cleaning

G. Federal Specifications (Fed. Spec):

RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

PART 2 - PRODUCTS

2.1 DESIGN CRITERIA

A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

B. Ladders and Rungs: 120 kg (250 pounds) at any point.

C. Railings and Handrails: 900 N (200 pounds) in any direction at any point.

E. Manhole Covers: 1200 kg/m^2 (250 pounds per square foot).

2.2 MATERIALS

A. Structural Steel: ASTM A36.

B. Stainless Steel: ASTM A240, Type 302 or 304.

C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified. For structural shapes use alloy 6061-T6 and alloy 6061-T4511.

D. Floor Plate:

1. Steel ASTM A786.

2. Aluminum: ASTM B632.

E. Steel Pipe (Bollard): ASTM A53.

1. Galvanized for exterior locations.

2. Type S, Grade A unless specified otherwise.
3. NPS (inside diameter) as shown.

F. Cast-Iron: ASTM A48, Class 30, commercial pattern.

G. Malleable Iron Castings: A47.

H. Primer Paint: As specified in Section 09 91 00, PAINTING.

I. Stainless Steel Tubing: ASTM A269, type 302 or 304.

J. Modular Channel Units:

1. Factory fabricated, channel shaped, cold formed sheet steel shapes, complete with fittings bolts and nuts required for assembly.
2. Form channel within turned pyramid shaped clamping ridges on each side.
3. Provide case hardened steel nuts with serrated grooves in the top edges designed to be inserted in the channel at any point and be given a quarter turn so as to engage the channel clamping ridges. Provide each nut with a spring designed to hold the nut in place.
4. Factory finish channels and parts with oven baked primer when exposed to view. Channels fabricated of ASTM A525, G90 galvanized steel may have primer omitted in concealed locations. Finish screws and nuts with zinc coating.
5. Fabricate snap-in closure plates to fit and close exposed channel openings of not more than 0.3 mm (0.0125 inch) thick stainless steel.

K. Grout: ASTM C1107, pourable type.

L. Insect Screening: ASTM D3656.

2.3 HARDWARE

A. Rough Hardware:

1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.

B. Fasteners:

1. Bolts with Nuts:
   a. ASME B18.2.2.

b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.

c. ASTM F468 for nonferrous bolts.

d. ASTM F593 for stainless steel.

2. Screws: ASME B18.6.1.

3. Washers: ASTM F436, type to suit material and anchorage.

4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

2.4 FABRICATION GENERAL

A. Material

1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.
2. Use material free of defects which could affect the appearance or service ability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding, riveting or bolting.
2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:
   a. Fabricate items to design shown.
   b. Furnish members in longest lengths commercially available within the limits shown and specified.
   c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
   d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
   e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
   f. Prepare members for the installation and fitting of hardware.
   g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
   h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:
   a. Weld in accordance with AWS.
   b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
   c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
   d. Finish welded joints to match finish of adjacent surface.
3. Joining:
   a. Miter or butt members at corners.
   b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
   a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
   b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
   a. Accurately cut, machine and fit joints, corners, copes, and miters.
   b. Fit removable members to be easily removed.
   c. Design and construct field connections in the most practical place for appearance and ease of installation.
   d. Fit pieces together as required.
   e. Fabricate connections for ease of assembly and disassembly without use of special tools.
   f. Joints firm when assembled.
   g. Conceal joining, fitting and welding on exposed work as far as practical.
   h. Do not show rivets and screws prominently on the exposed face.

i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

1. Finish exposed surfaces in accordance with NAAMM AMP 500 Metal Finishes Manual.
2. Aluminum: NAAMM AMP 501.
   a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
   b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
   c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
   d. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
   a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
   b. Surfaces exposed in the finished work:
      1) Finish smooth rough surfaces and remove projections.
      2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
   c. Shop Prime Painting:
      1) Surfaces of Ferrous metal:
         a) Items not specified to have other coatings.
         b) Galvanized surfaces specified to have prime paint.
         c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
         d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
         e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
      2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

5. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

G. Protection:

1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

2.5 SUPPORTS

A. General:

1. Fabricate ASTM A36 structural steel shapes as shown.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
3. Field connections may be welded or bolted.

B. For Ceiling Hung Toilet Stall:

1. Use a continuous steel channel above pilasters with hangers centered over pilasters.
2. Make provision for installation of stud bolts in lower flange of channel.
3. Provide a continuous steel angle at wall and channel braces spaced as shown.
4. Use threaded rod hangers.
5. Provide diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.

5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Trapeze Bars:
1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
3. Fabricate concealed components of structural steel shapes unless shown otherwise.
4. Stainless steel ceiling plate drilled for eye bolt.
5. Continuously weld connections where welds shown.
6. Use modular channel where shown with manufacturers bolts and fittings.
   a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
   b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.

E. For Intravenous Track and Cubical Curtain Track:
1. Fabricate assembly of steel angle as shown.
2. Drill angle bent ends for anchor screws to acoustical suspension system and angle for hanger wires.
3. Provide pipe sleeve welded to angle.

F. Supports at Ceiling for Radiographic (x-ray) Equipment:
1. Fabricate hangers braces, and track of modular channel units assembly as shown.
2. Fabricate steel plates for anchor to structure above.
3. Drill bent plates for bolting at mid height at concrete beams.

G. For Operating Room Light:
1. Fabricate as shown to suit equipment furnished.
2. Drill leveling plate for light fixture bolts.

H. Supports in Orthopedic Brace Shop:
   1. Fabricate from 25 mm (one inch) steel pipe, fasten to steel angles above and extend to a point 150 mm (6 inches) below finished ceiling.
   2. Lower end of the pipe shall have a standard pipe thread.
   3. Provide an escutcheon plate at ceiling.

I. Supports for Accordion Partition Tracks, Exercise Equipment, and Items at Various Conditions at Suspended Ceilings:
   1. Fabricate of structural steel shapes as shown.
   2. Drill for anchor bolts of suspended item.

J. Supports for Communion Rail Posts in Chapel:
   1. Fabricate one steel plate support for each post as shown.
   2. Drill for fasteners.

2.6 FRAMES

A. Elevator Entrance Wall Opening.
   1. Fabricate of channel shapes, plates, and angles as shown.
   2. Weld or bolt head to jamb as shown.
   3. Weld clip angles to bottom of frame and top of jamb members extended to structure above for framed construction.
      a. Provide holes for anchors.
      b. Weld head to jamb members.

B. Channel Door Frames:
   1. Fabricate of structural steel channels of size shown.
   2. Miter and weld frames at corners.
   3. Where anchored to masonry or embedded in concrete, weld to back of frame at each jamb, 5 mm (3/16 inch) thick by 44 mm (1-3/4 inch) wide steel strap anchors with ends turned 50 mm (2 inches), and of sufficient length to extend at least 300 mm (12 inches) into wall. Space anchors 600 mm (24 inches) above bottom of frame and 600 mm (24 inches) o.c. to top of jamb. Weld clip angles to bottom of jambs and provide holes for expansion bolts.
   4. Where anchored to concrete or masonry in prepared openings, drill holes at jambs for anchoring with expansion bolts. Weld clip angles to bottom of frame and provide holes for expansion bolt anchors as shown. Drill holes starting 600 mm (24 inches) above bottom of frame

and 600 mm (24 inches) o.c. to top of jamb and at top of jamb. Provide pipe spacers at holes welded to channel.

5. Where closure plates are shown, continuously weld them to the channel flanges.
6. Weld continuous 19 x 19 x 3 mm (3/4 x 3/4 x 1/8 inch) thick steel angles to the interior side of each channel leg at the head and jambs to form a caulking groove.
7. Prepare frame for installation of hardware specified in Section 08 71 00, DOOR HARDWARE.
   a. Cut a slot in the lock jamb to receive the lock bolt.
   b. Where shown use continuous solid steel bar stops at perimeter of frame, weld or secure with countersunk machine screws at not more than 450 mm (18 inches) on center.

C. Frames for Breech Opening:
   1. Fabricate from steel channels, or combination of steel plates and angles to size and contour shown.
   2. Weld strap anchors on back of frame at not over 600 mm (2 feet) on centers for concrete or masonry openings.

D. Frames for Lead Lined Doors:
   1. Obtain accurate dimensions and templates from suppliers of lead lined doors, finish hardware, and hollow steel door frames.
   2. Fabricate as shown for use in connection with lead lined doors.
   3. Deliver assembled frames with removable shipping spreaders at top and bottom.
   4. Extend angles at jambs from floor to structural slab above. At floors of interstitial spaces, terminate jamb sections and provide anchors as shown.
   5. Continuously weld plates and reinforcements to frame members and head members of angle frames between jambs.
   6. Weld strap anchors, not over 600 mm (24 inches) on centers, to the back of angles for embedment in masonry or concrete unless shown otherwise.
   7. Type 15 Door Frames:

a. Structural steel angle frames with plate or bar full height to heads. Extend reinforcing at hinge cutouts two inches beyond cutout.
b. Fabricate top anchorage to beam side at mid height.
c. Weld clip angles to both legs of angle at top and bottom.
d. Drill clips and plates, at top and bottom for anchoring jamb angles with two 9 mm (3/8 inch) expansion bolts at each location.
e. Cut rabbet for pivot hinges and lock strike.

2.7 GUARDS

A. Wall Corner Guards:
   1. Fabricate from steel angles and furnish with anchors as shown.
   2. Continuously weld anchor to angle.

B. Guard Angles for Overhead Doors:
   1. Cut away top portion of outstanding leg of angle and extend remaining portion of angle up wall.
   2. Weld filler piece across head of opening to jamb angles.
   3. Make provisions for fasteners and anchorage.

C. Channel Guard at Loading Platform:
   1. Fabricate from steel channel of size shown.
   2. Weld anchors to channels as shown.
   3. Drill channel for bumper anchor bolts.

D. Edge Guard Angles for Openings in slabs.
   1. Fabricate from steel angles of sizes and with anchorage shown.
   2. Where size of angle is not shown, provide 50 x 50 x 6 mm (2 x 2 x 1/4 inch) steel angle with 32 x 5 mm (1-1/4 x 3/16 inch) strap anchors, welded to back.
   3. Miter or butt angles at corners and weld.
   4. Use one anchor near end and three feet on centers between end anchors.

E. Wheel Guards:
   1. Construct wheel guards of not less than 16 mm (5/8 inch) thick cast iron.
   2. Provide corner type, with flanges for bolting to walls.

2.10 LOOSE LINTELS

A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.

B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.

C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.

1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 100 x 90 x 8 mm (4 x 3-1/2 x 5/16 inch).
2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

D. For 150 mm (6 inch) thick masonry openings 750 mm to 3000 mm (2-1/2 feet to 10 feet) use one angle 150 x 90 x 9 mm (6 x 3-1/2 x 3/8 inch).

E. Provide bearing plates for lintels where shown.

F. Weld or bolt upstanding legs of double angle lintels together with 19 mm (3/4 inch bolts) spaced at 300 mm (12 inches) on centers.

G. Insert spreaders at bolt points to separate the angles for insertion of metal windows, louver, and other anchorage.

H. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

I. Elevator Entrance:

1. Fabricate lintel from plate bent to channel shape, and provide a minimum of 100 mm (4 inch) bearing each end.
2. Cut away the front leg of the channel at each end to allow for concealment behind elevator hoistway entrance frame.

2.11 SHELF ANGLES

A. Fabricate from steel angles of size shown.

B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.

C. Provide adjustable malleable iron inserts for embedded in concrete framing.

2.12 PLATE DOOR SILL

A. Fabricate of checkered plate as detailed.
   1. Aluminum Plate: ASTM B632, 3 mm (0.125 inch) thick.
   2. Steel Plate: ASTM A786, 3 mm (0.125 inch thick), galvanized G90.
B. Fabricate for anchorage with flat head countersunk bolts at each end and not over 300 mm (12 inches), o.c.

2.13 SAFETY NOSINGS

A. Fed. Spec. RR-T-650, Type C.
   1. Aluminum: Class 2, Style 2.
   2. Cast iron: Class 4.
B. Fabricate nosings for exterior use from cast aluminum, and nosings for interior use from either cast aluminum or cast iron. Use one Class throughout.
C. Fabricate nosings approximately 100 mm (4 inches) wide with not more than 9 mm (3/8 inch) nose.
D. Provide nosings with integral type anchors spaced not more than 100 mm (4 inches) from each end and intermediate anchors spaced approximately 375 mm (15 inches) on center.
E. Fabricate nosings to extend within 100 mm (4 inches) of ends of concrete stair treads except where shown to extend full width.
F. Fabricate nosings to extend full width between stringers of metal stairs and full width of door openings.
G. On curved steps fabricate to terminate at point of curvature of steps having short radius curved ends.

2.15 RAILINGS

A. In addition to the dead load design railing assembly to support live load specified.
B. Fabrication General:
   1. Provide continuous welded joints, dressed smooth and flush.
   2. Standard flush fittings, designed to be welded, may be used.
   3. Exposed threads will not be approved.
   4. Form handrail brackets to size and design shown.
   5. Exterior Post Anchors.

a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts.

6. Interior Post Anchors:
a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
b. Weld or thread flanged fitting to posts at base.
c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
d. Provide sliding flange base plate on posts secured with set screws.
e. Weld flange base plate to removable posts set in sleeves.

C. Handrails:
1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.

D. Steel Pipe Railings:
1. Fabricate of steel pipe with welded joints.
2. Number and space of rails as shown.
3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
4. Form handrail brackets from malleable iron.
5. Fabricate removable sections with posts at end of section.
6. Removable Rails:
a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.

b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
c. Continuously weld brackets to post.
d. Provide slotted bolt holes in rail bracket.
e. Weld bolt heads flush with top of rail.
f. Weld flanged fitting to post where posts are installed in sleeves.

7. Opening Guard Rails:
   a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
   b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
   c. Fabricate rails for floor openings for anchorage in sleeves.
8. Gates:
   a. Fabricate from steel pipe as specified for railings.
   b. Fabricate gate fittings from either malleable iron or wrought steel.
   c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.
   d. Provide suitable stops, so that gate will swing as shown.
9. Chains:
   a. Chains: ASTM A391, Grade 63, straight link style, normal size chain bar 8 mm (5/16 inch) diameter, eight links per 25 mm (foot) and with boat type snap hook on one end, and through type eye bolt on other end.
   b. Fabricate eye bolt for attaching chain to pipe posts, size not less than 9 mm (3/8 inch) diameter.
   c. Fabricate anchor at walls, for engagement of snap hook of either a 9 mm (3/8 inch) diameter eye bolt or punched angle.
   d. Galvanize chain and bolts after fabrication.

E. Aluminum Railings:
   1. Fabricate from extruded aluminum.
   2. Use tubular posts not less than 3 mm (0.125 inch) wall thickness for exterior railings.

3. Punch intermediate rails and bottom of top rails for passage of posts and machine to a close fit.
4. Where shown use extruded channel sections for top rail with 13 mm (1/2 inch) thick top cover plates and closed ends.
5. Fabricate brackets of extruded or wrought aluminum as shown.
6. Fabricate stainless pipe sleeves with closed bottom at least six inches deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of posts where set in concrete.

F. Stainless Steel Railings:
1. Fabricate from 38 mm (1-1/2 inches) outside diameter stainless steel tubing, ASTM A269, having a wall thickness of 1.6 mm (0.065 inch).
2. Join sections by an internal connector to form hairline joints where field assembled.
3. Fabricate with continuous welded connections.
4. Fabricate brackets of stainless steel to design shown.
5. Fabricate stainless steel sleeves at least 150 mm (6 inches) deep having internal dimensions at least 13 mm (1/2 inch) greater than external dimensions of post.

2.18 SIDEWALK DOOR

A. Use flush, watertight, gutter type design.
B. Cover fabricate of 6 mm (1/4 inch) thick, diamond pattern floor plate.
C. Use automatic lock hold open feature and be hung on two flush type heavy bronze hinges capable of 90 degree swing on each door leaf.
D. Equip with locking and latching device and lifting devices; operable and accessible from both sides of doors.
E. Doors removable without disturbing frame.
F. Provide gutters at all joints for drainage of water.

2.19 SCREENED ACCESS DOORS AND FRAMES

A. Galvanized ASTM A123, G-90 after fabrication.
B. Wall frame:
1. Fabricate frame from steel angles or channels as shown.
2. Continuously weld 38 x 13 mm (1-1/2 x 1/2 inch) steel channel door stop to angle frame. Cut out lock strike opening in channel.

3. Miter and weld channel frame at corners. Reinforce corner with 3 mm (1/8 inch) plate angle.
4. Reinforce channel frame with 3 x 150 mm (1/8 x 6 inch) long steel plate at channel back to cutout for latch. Cutout lock strike opening in channel face. Drill and tap for hinge anchorage.
5. Drill jambs for 6 mm (1/4 inch) bolt anchors at top and bottom and not over 450 mm (18 inches) between top and bottom.
6. Fabricate frame for door to sit flush with face of frame.

C. Doors
1. Fabricate door using steel channel frame with 3 mm (1/8 inch) angle plate reinforcing at corners.
2. Miter and weld corners.
3. Fabricate lock box of 1.6 mm (1/16 inch) plate and weld to channel surround.
4. Provide wire mesh constructed of 3.5 mm (0.135 inch) diameter galvanized steel wire crimped and woven into 38 mm (1-1/2 inch) diamond mesh pattern. Fasten the wire mesh to door frames by bending the ends of each strand of wire over through channel clinched and welded to channel door frame.
5. Weld steel plate back-bands to channel door frame at hinge stiles only.
6. Screen on doors in exterior walls.
   a. Fabricate rewirable frame for screen from either extruded or tubular aluminum.
   b. Design to allow for removing or replacement frame and screening or adjoining items without damage.
   c. Use aluminum insect screening specified.
   d. Use stainless steel fasteners for securing screen to door.

D. Hardware:
1. Install hinged door to fixed frame with two 63 mm (2-1/2 inch) brass or bronze hinges.
2. Install lock or latch specified in Section 08 71 00, DOOR HARDWARE in lockbox.

2.20 STEEL COUNTER OR BENCH TOP FRAME AND LEGS

A. Fabricate channel or angle frame with mitered and welded corners as shown.

B. Drill top of frame with 6 mm (1/4inch) holes spaced 200 mm (8 inches) on center for securing countertop.

C. Fabricate legs of angle or pipe shapes and continuously weld to frame.

D. Finish frame with backed on enamel prime coat.

2.21 STEEL PIPE BOLLARD

Provide bollard in accordance with ASTM A53 with dimensions as shown in standard detail SD320523-04. Anchor posts in concrete and fill solidly with concrete with a minimum compressive strength of 17 MPa 2500psi.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Items set into concrete or masonry.

1. Provide temporary bracing for such items until concrete or masonry is set.
2. Place in accordance with setting drawings and instructions.
3. Build strap anchors, into masonry as work progresses.

C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.

D. Field weld in accordance with AWS.

1. Design and finish as specified for shop welding.
2. Use continuous weld unless specified otherwise.

E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.

F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.

G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.

H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

A. Anchorage to structure.

1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
2. Secure supports to concrete inserts by bolting or continuous welding as shown.
3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
4. Secure steel plate or hat channels to studs as detailed.

B. Ceiling Hung Toilet Stalls:

1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
2. Bolt continuous steel angle at wall to masonry or weld to face of each metal stud.
3. Secure brace for steel channels over toilet stall pilasters to wall angle supports with bolts at each end spaced as shown.
4. Install diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
5. Install stud bolts in lower flange of channel before installing furred down ceiling over toilet stalls.
6. Install support for ceiling hung pilasters at entrance screen to toilet room similar to toilet stall pilasters.

C. Supports for Wall Mounted items:

1. Locate center of support at anchorage point of supported item.
2. Locate support at top and bottom of wall hung cabinets.
3. Locate support at top of floor cabinets and shelving installed against walls.
4. Locate supports where required for items shown.

D. Support at Ceiling for X-ray Tube Stand and Radiographic Equipment:
   1. Bolt modular steel channel frames to hangers as shown, anchored to structure above.
   2. Fasten frames with modular channel manufacturers fittings, bolts, and nuts. Space modular channel supports and hangers as shown and as required to suit equipment furnished.
   3. Install closure plates in channels at ceiling where channel opening is visible. Coordinate and cut plates to fit tight against equipment anchors after equipment anchors are installed.

E. Ceiling Support for Operating Light:
   1. Anchor support to structure above as shown.
   2. Set leveling plate as shown level with ceiling.
   3. Secure operating light to leveling plate in accordance with light manufacturer's requirements.

F. Supports for intravenous (IV) Track and Cubicle Curtain Track:
   1. Install assembly where shown after ceiling suspension grid is installed.
   2. Drill angle for bolt and weld nut to angle prior to installation of tile.

G. Support for cantilever grab bars:
   1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
   2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 9 mm (3/8 inch) diameter bolts.
   3. Anchor to floors and overhead construction with two 9 mm (3/8 inch) diameter bolts.
   4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.

H. Supports for Trapeze Bars:
   1. Secure plates to overhead construction with fasteners as shown.
   2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
   3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.

a. Install closure plates in channel between eye bolts.

b. Install eyebolts in channel.

I. Support for Communion Rail Posts:

1. Anchor steel plate supports for posts as shown.

2. Use four bolts per plate, locate two at top and two at bottom.

3. Use lag bolts.

3.3 COVERS AND FRAMES FOR PITS AND TRENCHES

A. Set frame and cover flush with finish floor.

B. Secure plates to frame with flat head countersunk screws.

C. Set gratings loose in drainage trenches or over pits unless shown anchored.

3.4 FRAMES FOR LEAD LINED DOORS

A. Secure jamb angle clips and plates, at top and bottom with two, 9 mm (3/8 inch) expansion bolts to concrete.

B. Secure 150 x 90 x 13 mm (6 x 3-1/2 x 1/2 inch) angle to steel framing for anchorage when expansion bolts to concrete is not possible.

C. Secure clips by welding to steel.

D. At interstitial spaces, anchor jamb angles as shown.

3.5 DOOR FRAMES

A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.

B. Level and plumb frame; brace in position required.

C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.

D. Set frames in formwork for frames cast into concrete.

E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

3.6 OTHER FRAMES

A. Set frame flush with surface unless shown otherwise.

B. Anchor frames at ends and not over 450 mm (18 inches) on centers unless shown otherwise.

C. Set in formwork before concrete is placed.

3.7 GUARDS

A. Steel Angle Corner Guards:

1. Build into masonry as the work progress.

2. Set into formwork before concrete is placed.
3. Set angles flush with edge of opening and finish floor or wall or as shown.
4. At existing construction fasten angle and filler piece to adjoining construction with 16 mm (5/8 inch) diameter by 75 mm (3 inch) long expansion bolts 450 mm (18 inches) on center.
5. Install Guard Angles at Edges of Stairwell, Openings in Slab, Overhead Doors where shown.

B. Channel Guard at Top Edge of Concrete Platforms:
1. Install in formwork before concrete is placed.
2. Set channel flush with top of the platform.

C. Wheel Guards:
1. Set flanges of wheel guard at least 50 mm (2 inches) into pavement.
2. Anchor to walls as shown, expansion bolt if not shown.

3.8 GRATINGS

A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.
B. Set frame in formwork before concrete is placed.
C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.
D. Secure removable supporting members in place with stainless steel bolts.
E. Bolt gratings to supports.

3.9 STEEL LINTELS

A. Use lintel sizes and combinations shown or specified.
B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.
C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

3.10 SHELF ANGLES

A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.
B. Provide expansion space at end of members.

3.11 PLATE DOOR SILL

A. Install after roofing base flashing and counter flashing work is completed.

B. Set in sealant and bolt to curb.

3.12 SAFETY NOSINGS

A. Except as specified and where preformed rubber treads are shown or specified install safety nosings at the following:

1. Exterior concrete steps.
2. Door sills of areaway entrances curbs.
3. Exposed edges of curbs of door sills at transformer and service rooms.
4. Interior concrete steps, including concrete filled treads of metal stairs of service stairs.

B. Install flush with horizontal and vertical surfaces.

C. Install nosing to within 100 mm (4 inches) of ends of concrete stair treads, except where shown to extend full width.

D. Extend nosings full width of door openings.

E. Extend nosings, full width between stringers of metal stairs, and terminate at point of curvature of steps having short radius curved ends.

3.14 RAILINGS

A. Steel Posts:

1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
2. Install sleeves in concrete formwork.
3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
5. Secure sliding flanged fittings to posts at base with set screws.
6. Secure fixed flanged fittings to concrete with expansion bolts.
7. Secure posts to steel with welds.

B. Aluminum Railing, Stainless Steel Railing, and Ornamental Railing Posts:
   1. Install pipe sleeves in concrete formwork.
   2. Set posts in sleeve and pour grout to surface on exterior locations and to within 6 mm (1/4 inch) of surface for interior locations except to where posts are required to be removable.
   3. Apply beveled bead of urethane sealant over sleeve at post perimeter for exterior posts and flush with surface for interior posts as specified in Section 07 92 00, JOINT SEALANTS.

C. Anchor to Walls:
   1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
      a. Anchor steel plate to concrete or solid masonry with expansion bolts.
      b. Anchor steel plate to hollow masonry with toggle bolts.
   2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

D. Removable Rails:
   1. Rest rails in brackets at each end and secure to bracket with stainless steel bolts and nuts where part of a continuous railing.
   2. Rest rail posts in sleeves where not part of a continuous railing. Do not grout posts.

E. Gates:
   1. Hang gate to swing as shown.
   2. Bolt gate hinges to jamb post with clamp on or through bolts.

F. Chains:
   1. Eye bolt chains to pipe posts.
   2. Eye bolt anchoring at walls.
      a. Expansion bolt to concrete or solid masonry.
      b. Toggle bolt to hollow masonry of frame wall installed support.

G. Handrails:
   1. Anchor brackets for metal handrails as detailed.

2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.16 SIDEWALK DOOR, TRAP DOORS, AND FRAMES

A. Set frame flush with finished concrete slab or curb.
B. Secure well linings to structure with expansion bolts unless shown otherwise.
C. Bolt ceiling hatch to well lining angle brace and to angle iron frames near corners and 300 mm (12 inches) on centers with not less than 9 mm (3/8 inch) roundhead machine screws.
D. Coordinate sidewalk door drain connections with plumbing work.

3.17 SCREENED ACCESS DOOR

A. Set frame in opening so that clearance at jambs is equal and secure with expansion bolts.
B. Use shims at bolts to prevent deformation of frame members in prepared openings.
C. Set frame in mortar bed and build in anchors as the masonry work progresses.
D. Grout jambs solid with mortar.
E. Secure insect screen to inside of door with stainless steel fasteners on doors in exterior walls.

3.18 STEEL COMPONENTS FOR MILLWORK ITEMS

Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.19 INSTALLATION OF STEEL PIPE BOLLARD

Set bollards vertically in concrete piers. Compressive strength of concrete piers shall be 21MPa 3000psi. For dimensions of concrete piers See standard detail SD320523-04.

3.20 CLEAN AND ADJUSTING

A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame

and, where applicable, contact surfaces fit tight and even without forcing or warping the components.

B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

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DIVISION 06
WOODS, PLASTICS AND COMPOSITES

10-01-17

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, and light wood construction.

1.2 RELATED WORK:

A. Sustainable design requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

C. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

D. Cement board sheathing: Section 06 16 63, CEMENTITIOUS SHEATHING.

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. Postconsumer and preconsumer recycled content as specified in PART 2 - PRODUCTS.
2. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.
3. For composite wood products, submit documentation indicating that product contains no added urea formaldehyde.

C. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

D. Manufacturer’s Literature and Data:

1. Submit data for lumber, panels, hardware and adhesives.
2. Submit data for wood-preservative 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-24.....National Design Specification for Wood Construction

WCD1-01.....Details for Conventional Wood Frame Construction

C. American Institute of Timber Construction (AITC):

A190.1-22.....Structural Glued Laminated Timber

D. American Society of Mechanical Engineers (ASME):

B18.2.1-12(R2021).....Square and Hex Bolts and Screws

B18.2.2-18.....Square and Hex Nuts

B18.6.1-81(R2017).....Wood Screws

E. American Plywood Association (APA):

E30.....Engineered Wood Construction Guide

F. ASTM International (ASTM):

A653/A653M-23.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

C954-22.....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

C1002-22.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs

D198-16.....Test Methods of Static Tests of Lumber in Structural Sizes

D2344/D2344M-22.....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

D3498-19a.....Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems

D6108-24.....Test Method for Compressive Properties of Plastic Lumber and Shapes

D6109-24.....Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products

D6111-24.....Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement

D6112-23.....Test Methods for Compressive and Flexural Creep and Creep-Rupture of Plastic Lumber and Shapes

F844-07a(R2024).....Washers, Steel, Plan (Flat) Unhardened for General Use

F1667-21a.....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.

C. 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.
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.

D. 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.

E. 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.

F. 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.

G. 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 PLASTIC LUMBER:

2.3 PLYWOOD:

2.4 STRUCTURAL-USE PANELS:

2.5 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.

PART 3 - EXECUTION

3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:

A. Conform to applicable requirements of the following:

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.

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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01-01-21

SECTION 06 16 63
CEMENTITIOUS SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cement board sheathing at exterior framed wall construction.

1.2 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.

B. American National Standards Institute (ANSI):

1. A118.9-24 - Cementitious Backer Units.

C. ASTM International (ASTM):

1. C954-22 - Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
2. C1002-22 - Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
3. C1325-22 - Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.

1.3 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.
3. Warranty.

C. Provide Sustainable Construction Requirements-Provide in accordance with other Division 1 sections.

1.4 DELIVERY AND STORAGE

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.5 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant sheathing against material and manufacturing defects.

1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

A. Provide each product from one manufacturer.

B. Sustainable Construction Requirements:

1. Sheathing Recycled Content: Select products with recycled content to achieve overall Project recycled content requirement.

2.2 SHEATHING

A. Cement Boards: Meeting ANSI A118.9 and ASTM C1325.

1. Thickness5/8 inch.

2. Width: 1219 mm (48 inches), minimum.

2.3 ACCESSORIES

A. Steel Drill Screws: Corrosion-resistant, self-drilling.

1. ASTM C1002, Type S for fastening to framing less than 0.8 mm (33 mils) thick.

2. ASTM C954 for fastening to framing 0.8 mm (33 mils) thick and greater.

B. Joint Reinforcement: Alkali resistant tape as recommended by sheathing manufacturer.

C. Bonding Material: As recommended by sheathing manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Verify framing is plumb and level and in plane.

D. Correct substrate deficiencies.

3.2 SHEATHING INSTALLATION

A. Install products according to manufacturer's instructions.

1. Secure units to framing members with screws spaced maximum 200 mm (8 inches) o.c. and not closer than 13 mm (1/2 inch) from edge of unit.
2. Install screw heads without penetrating cement board surface.
3. Install sheathing with 6 mm (1/4 inch) gap where sheathing abuts masonry or similar materials to prevent wicking of moisture.
4. Install sheathing with 10 mm (3/8 inch) gap where non-load-bearing construction abuts structural elements or building expansion joints.
5. Horizontal Installation: Abut ends of boards over centers of studs. Stagger end joints minimum one stud spacing for adjacent boards. Fasten boards at perimeter and within field of board to each stud.
6. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Fasten boards at perimeter and with fin field of board to each stud.
7. Apply bonding material to imbed tape and completely fill board joints, and gaps between each panel.

3.3 PROTECTION

A. Remove loose or spalling joint finish. Patch areas missing joint finish.

B. Replace broken or damaged boards.

C. Protect boards from moisture using temporary coverings until finishes are applied.

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DIVISION 07
THERMAL AND MOISTURE PROTECTION

01-01-21

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Complete roof removal for new roof system installation.
2. Partial roof removal for new roof system installation.
3. Roofing membrane and selective roofing system component removal for new roof membrane installation.
4. Existing roofing membrane preparation for new roofing membrane system installation.

B. Existing Roofing System: EPDM and TPO. System components include:

1. Roofing membrane.
2. Roof insulation.
3. Vapor retarder.
4. Substrate board.

1.2 RELATED WORK

A. Section 06 10 00, ROUGH CARPENTRY: Replacement Roof Deck and Parapet Sheathing.
B. Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING: New Roofing System.
C. Section 07 54 23, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING: New Roofing System.
D. Section 07 60 00, FLASHING AND SHEET METAL: Sheet Metal Counterflashing.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
FX-1 (R2016).....Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
C. American Society for Nondestructive Testing (ASNT):
SNT-TC-1A (2019).....Personnel Qualification and Certification for Nondestructive Testing.

D. ASTM International (ASTM):

C208-12(2017)e2.....Cellulosic Fiber Insulating Board.

C578-21.....Rigid, Cellular Polystyrene Thermal Insulation.

C728-21.....Perlite Thermal Insulation Board.

C1177/C1177M-20.....Glass Mat Gypsum Substrate for Use as Sheathing.

C1153-10(2016).....Location of Wet Insulation in Roofing Systems Using Infrared Imaging.

C1278/C1278M-21.....Standard Specification Fiber-Reinforced Gypsum Panel.

D4263-83(2017).....Indicating Moisture in Concrete by the Plastic Sheet Method.

E. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

DOC PS 1-09.....Structural Plywood.

DOC PS 2-18.....Performance Standard for Wood-Based Structural-Use Panels.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Contractor.
   c. Installer.
   d. Manufacturer's field representative.
   e. Other installers responsible for adjacent and intersecting work, including mechanical and electrical equipment installers.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
   a. Removal and installation schedule.
   b. Removal and installation sequence.
   c. Preparatory work.
   d. Protection before, during, and after installation.

e. Removal and installation.

f. Temporary roofing including daily terminations.

g. Transitions and connections to other work.

h. Inspecting and testing.

i. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Description of temporary roof system and components.
3. List of patching materials.
4. Recover board fastening requirements.
5. Temporary roofing installation instructions and removal instructions. preparation instructions to receive new roofing.

6. Existing roofing warrantor's instructions.

D. Photographs: Document existing conditions potentially affected by roofing operations before work begins.

E. Field Inspection Reports:

1. Certify warrantor inspected completed roofing and existing warranty remains in effect.

F. Infrared Roof Moisture Survey Report.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Same installer as Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING Section 07 54 23, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING .
2. Licensed to perform asbestos abatement in Project jurisdiction when removal of asbestos-containing material is required.

3. Approved by existing roofing system warrantor when work affects existing roofing system under warranty.

1.7 FIELD CONDITIONS

A. Building Occupancy: Perform work to minimize disruption to normal building operations.

1. Verify occupants are evacuated from affected building areas when working on structurally impaired roof decking above occupied areas.
2. Provide notice minimum 72 hours before beginning activities affecting normal building operations.

B. Existing Roofing Available Information:

1. The following are available for Contractor reference:

a. Construction drawings and project manual.

2. Examine available information before beginning work of this section.

C. Weather Limitations: Proceed with reroofing preparation only during dry weather conditions as specified for new roofing installation in Section Section 07 53 23, ETHYLENE-PROPYLENE-DIENE-MONOMER (EPDM) ROOFING Section 07 54 23, THERMOPLASTIC POLYOLEFIN (TPO) ROOFING.

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

D. Hazardous materials are not expected in existing roofing system.

1. Known hazardous materials were removed before start of work.
2. Do not disturb suspected hazardous materials. When discovered, notify Contracting Officer's Representative.
3. Hazardous materials discovered during execution of the work will be removed by Government as work of a separate contract.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Existing Warranties: Perform work to maintain existing roofing warranty in effect.
   1. Notify warrantor before beginning, and upon completion of reroofing.
   2. Obtain warrantor's instructions for maintaining existing warranty.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Patching Materials: Match existing roofing system materials.

B. Plywood Sheathing: See Section 06 10 00, ROUGH CARPENTRY.

C. Metal Flashing: See Section 07 60 00, FLASHING AND SHEET METAL.

D. Temporary Protection Materials:
   1. Expanded Polystyrene (EPS) Insulation: ASTM C578-19.
   2. Plywood: NIST DOC PS 1-19, Grade CD Exposure 1-18.
   3. Oriented Strand Board (OSB): NIST DOC PS 2-18, Exposure 1.

E. Temporary Roofing System Materials: Contractor's option.

F. Fasteners: Type and size required by roof membrane manufacturer to resist wind uplift.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Infrared Roof Moisture Survey: Ground-based, walk-over type performed according to ASTM C1153-10(2015).
   1. Record the entire survey on DVD and provide one copy to Contracting Officer's Representative with report.
   2. Include in report thermograms of suspect areas and corresponding daytime photos of same locations.
   3. Conduct inspection by NDT test technician certified to at least Level 2 in Thermal/Infrared test method according to ASNT SNT-TC-1A.
   4. Mark out roof areas determined to be wet to indicate minimum areas to be removed.

3.2 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing roofing system indicated to remain.
   1. Cover roof membrane with temporary protection materials without impeding drainage.

2. Limit traffic and material storage to protected areas.
3. Maintain temporary protection until replacement roofing is completed.

C. Protect existing construction and completed work from damage.

D. Protect landscaping from damage.

E. Maintain access to existing walkways and adjacent occupied facilities.

F. Coordinate use of rooftop fresh air intakes with Contracting Officer's Representative to minimize effect on indoor air quality.

G. Ensure temporary protection materials are available for immediate use in case of unexpected rain.

H. Ensure roof drainage remains functional.
1. Keep drainage systems clear of debris.
2. Prevent water from entering building and existing roofing system.

I. Coordinate rooftop utilities remaining active during roofing work with Contacting Officer's Representative.

3.3 RE-ROOFING PREPARATION - GENERAL

A. Notify Contacting Officer's Representative of planned operations, daily.
1. Identify location and extent of roofing removal.
2. Request authorization to proceed.

3.4 OVERBURDEN REMOVAL

3.5 COMPLETE ROOFING SYSTEM REMOVAL

3.6 PARTIAL ROOFING SYSTEM REMOVAL

A. Remove existing roofing completely, exposing structural roof deck at locations and to extent indicated on drawings.
1. Remove roof insulation, vapor retarder, and substrate board .
2. Remove or cut-off roofing system fasteners.

3.7 ROOFING MEMBRANE AND SELECTIVE ROOFING SYSTEM COMPONENT REMOVAL

A. Remove existing roofing membrane, only, in locations and to extent indicated on drawings.

B. Visually inspect roof insulation, vapor retarder, and substrate board for moisture immediately after roof membrane removal.
1. Coordinate with Contracting Officer's Representative to observe inspections.

2. Identify wet roofing system components required to be removed.
3. Mark roofing system removal locations and extents.

C. Remove wet roofing system components.
1. Remove or cut-off roofing system fasteners when removals expose structural roof deck.

D. Patch selective roofing system removals immediately after inspection and repair.

E. Install patching materials to match existing roofing system.

F. Patch roofing membrane to maintain building watertight, unless new roofing membrane is installed same day as removal and repair.

3.8 DECK PREPARATION

A. Inspect structural roof deck after roofing system removal.

B. Concrete Roof Decks:
1. Visually confirm concrete roof deck is dry.
2. Perform moisture test according to ASTM D4263-83(2018) each day for each separate roof area.
a. Proceed with roofing work only when moisture is not observed.

C. Steel Roof Decks:
1. Visually inspect structural roof deck installation and fasteners.
a. Notify Contracting Officer's Representative of unsuitable conditions and inadequate fastenings potentially affecting roof system performance.

3.9 TEMPORARY ROOFING

A. Install temporary roofing to maintain building watertight.

B. Remove temporary roofing before installing new roofing.

C. Prepare temporary roofing to receive new roofing.

3.10 EXISTING MEMBRANE PREPARATION FOR NEW ROOFING

A. Remove existing roofing surface projections and irregularities. Produce smooth surface to receive recover boards.
1. Broom clean existing surface.

3.11 BASE FLASHING REMOVAL

A. Expose base flashings to permit removal.
   1. Two-Piece Counterflashings: Remove cap flashing and store for reuse.
   2. Single Piece Counterflashings: Carefully bend counterflashing.
   3. Metal Copings: Remove decorative cap and store for reuse.
B. Remove existing base flashings.
   1. Clean substrates to receive new flashings.
C. Replace counterflashings damaged during removal.
   1. Counterflashings: See Section 07 60 00 FLASHING AND SHEET METAL.

3.12 RECOVER BOARD INSTALLATION

3.13 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

   1. Fastener Pull Out Tests: ANSI/SPRI FX-1(2016).
B. Existing Roofing System Warrantor Services:
   1. Inspect reroofing preparation and roofing installation to verify compliance with existing warranty conditions.
   2. Submit reports of field inspections, and supplemental instructions issued during inspections.

3.14 DISPOSAL

A. Collect waste materials in containers.
B. Remove waste materials from project site, regularly, to prevent accumulation.
C. Legally dispose of waste materials.

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DASECTION 07 13 00
SHEET WATERPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies sheet waterproofing materials used for shower pan waterproofing in personnel showers.

1.2 QUALITY CONTROL

A. Approval by the COR is required of products of proposed manufacturers.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Sheet waterproofing.
2. Printed installation instructions.

C. Certificates:

1. Sheet waterproofing manufacturer's approval of adhesive used.
2. Waterproofing tests report indicating that water test as specified has been made for each shower area and that each area was found to be watertight.

D. Samples:

1. Sheet waterproofing, 150 mm (6 inches) square.
2. Waterproofed building paper, 150 square mm (6 inches square).
3. Adhesive, 0.24 L (1/2 pint).

1.4 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to job in manufacturer's original unopened containers with brand name marked thereon.

B. Unload and store to prevent injury to materials.

1. 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).

1.5 WARRANTY

A. Shower pan waterproofing is subject to the terms of Article titled "Warranty of Construction”, FAR clause 52.246-21, except that warranty period is extended to two years.

1.6 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced by basic designation only.

B. Federal Specification (Fed. Spec.):
UU-B-790A INT AMD 1.....Building Paper, Vegetable Fiber: (Kraft, Waterproof, Water Repellent and Fire Resistant)

PART 2 - PRODUCTS

2.1 SHOWER PAN WATERPROOFING SHEET:

A. Rubber type sheet formed of non-reinforced, homogeneous, impermeable, sheeting compound reduced to thermoplastic state, resistant to fungus, mildew and bacteria, not less than 1.5 mm (60 mils) thick.

B. Asphaltic sheet formed with a laminated asphalt construction consisting of eight plies of Kraft paper bonded and saturated by seven layers of asphalt, reinforced with three layers of glass fibers and faced with polyethylene sheet; total weight 1.9 kilogram/square meter (0.40 pounds per square foot).

2.2 ADHESIVES:

A. As furnished by the manufacturer of the sheet waterproofing.

B. Compatible with adjacent materials where contact occurs.

2.3 WATERPROOFED BUILDING PAPER:

A. Fed. Spec. UU-B-790, Type I, Grade C.

2.4 CONCRETE PATCHING COMPOUND:

A. Portland cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors.

B. Have not less than the following physical properties:
1. Compressive strength - 25 mPa (3500 psi).
2. Tensile strength - 7 mPa (1000 psi).
3. Flexural strength - 7 mPa (1000 psi).
4. Density - 1.9.

C. Capable of being applied in layers up to 50 mm (two inches) thick, being brought to a feather edge, and being troweled to a smooth finish.

D. Ready for use in 48 hours after application.

PART 3 - EXECUTION

3.1 PREPARATION:

A. Before installing shower pan waterproofing, adjoining surfaces shall be clean, smooth, firm and dry.

B. Concrete surfaces shall be cured a minimum of seven days and be free from release agents, concrete curing agents, and other contaminates.

C. Remove all high spots and loose and foreign particles and fill all voids, depressions joints and cracks with concrete patching compound.

D. Ensure vertical surfaces have a continuous supportive back substrate for waterproofing.

3.2 INSTALLATION:

A. Coat entire surfaces to receive shower pan waterproofing with adhesive spread at rate of 1 liter/square meter (one gallon per 40 square feet).

B. Butt joints and cover with a strip of the waterproofing sheeting material eight inches in width and seal with adhesive.

C. Carry sheeting up vertical surfaces not less than 4 inches above surface of shower floor. Carry over tops of curbs.

D. Roll entire horizontal surfaces with 23 to 45 kg (50 to 100 pounds) roller and roll corners and vertical sections with a rubber roller to insure solid anchorage.

E. Make cut out for floor drains and fit to drain for watertight assembly, coordinating with drain installation.

3.3 PROTECTION:

A. When finish floor will not be immediately installed, protect waterproofing pan.

B. Cover with 2 inches of sand or waterproofed building paper.

C. Maintain protection until finished floor is placed.

3.4 WATER TEST:

A. Test in presence of COR for leaks before permanent finish is applied over shower pan waterproofing.

B. Seal floor drain watertight and fill waterproofing pan with water to within approximately 25 mm (1 inch) of top of its vertical surfaces.

C. When leakage occurs, repair waterproofing and repeat testing until no leakage occurs.

D. Submit certificate to COR of test results.

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01-01-21

SECTION 07 21 13
THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermal insulation.
   a. Board or block insulation at foundation perimeter.
   b. Batt or blanket insulation at exterior furred walls.
   c. Board or block insulation at floor assemblies above unconditioned spaces.
   d. Board or block insulation at masonry cavity walls.
   e. Loose fill insulation at exterior hollow masonry walls.
2. Acoustical insulation.
   a. Semi-rigid insulation at interior framed partitions.
   b. Batt and blanket insulation at interior framed partitions.
   c. Board insulation at interior concrete and masonry partitions.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Adhesives VOC Limits.
B. Section 04 20 00, UNIT MASONRY: Insulation for Cavity Face of Masonry.
C. Section 07 84 00, FIRESTOPPING: Safing Insulation.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):

C516-16.....Vermiculite Loose Fill Thermal Insulation.
C549-17.....Perlite Loose Fill Insulation.
C552-17 .....Cellular Glass Thermal Insulation.
C553-20.....Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
C578-21.....Rigid, Cellular Polystyrene Thermal Insulation.
C591-20.....Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
C612-20.....Mineral Fiber Block and Board Thermal Insulation.

C665-20.....Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

C728-17.....Perlite Thermal Insulation Board.

C954-22.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch to 0.112 inch (2.84 mm) in thickness.

C1002-21.....Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

D312/D312M-22.....Asphalt Used in Roofing.

E84-23.....Surface Burning Characteristics of Building Materials.

F1667-20.....Driven Fasteners: Nails, Spikes, and Staples.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show insulation type, thickness, and R-value for each location.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Adhesive indicating manufacturer recommendation for each application.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials: Show volatile organic compound types and quantities.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

C. Protect foam plastic insulation from UV exposure.

1.7 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 INSULATION - GENERAL

A. Insulation Thickness:

1. Provide thickness required by R-value shown on drawings.
2. Provide thickness indicated when R-value is not shown on drawings.

B. Insulation Types:

1. Provide one insulation type for each application.

C. Sustainable Construction Requirements:

1. Insulation Recycled Content:
   a. Polyisocyanurate/polyurethane rigid foam: 9 percent recovered material.
   b. Polyisocyanurate/polyurethane foam-in-place: 5 percent recovered material.
   c. Glass fiber reinforced: 6 percent recovered material.
   d. Phenolic rigid foam: 5 percent recovered material.
   e. Rock wool material: 75 percent recovered material.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-Flooring Adhesives and Sealants.

2.2 THERMAL INSULATION

A. Exterior Furring Insulation:

1. Mineral Fiber: ASTM C665, Type II, Class C, Category I where concealed by thermal barrier.
2. Mineral Fiber: ASTM C665, Type III, Class A at other locations.

B. Inside Face of Exterior Wall Insulation:

1. Mineral Fiber Board: ASTM C612, Type IB or II.
2. Perlite Board: ASTM C728.
3. Cellular Glass Block: ASTM C552, Type I.
4. Cellular Glass Block: ASTM C552, Type I.

2.3 ACOUSTICAL INSULATION

A. Semi Rigid, Batts and Blankets:

1. Widths and lengths to fit tight against framing.
2. Mineral Fiber boards: ASTM C553, Type II, flexible, or Type III, semi rigid unfaced .
   a. Density: nominal 4.5 pound.
3. Mineral Fiber Batt or Blankets: ASTM C665 unfaced.
4. Maximum Surface Burning Characteristics: ASTM E84.
   a. Flame Spread Rating: 25.
   b. Smoke Developed Rating: 450.

B. Sound Deadening Board:

1. Mineral Fiber Board: ASTM C612, Type IB.
   a. Thickness: 13 mm (1/2 inch).
2. Perlite Board: ASTM C728.
   a. Thickness: 13 mm (1/2 inch).

2.4 ACCESSORIES

A. Fasteners:

1. Staples or Nails: ASTM F1667, zinc-coated, size and type to suit application.
2. Screws: ASTM C954 or ASTM C1002, size and length to suit application with washer minimum 50 mm (2 inches) diameter.
3. Impaling Pins: Steel pins with head minimum 50 mm (2 inches) diameter.
   a. Length: As required to extend beyond insulation and retain cap washer when washer is placed on pin.
   b. Adhesive: Type recommended by manufacturer to suit application.

B. Insulation Adhesive: Nonflammable type recommended by insulation manufacturer to suit application.

C. Tape: Pressure sensitive adhesive on one face.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install insulation with vapor barrier facing the heated side, unless indicated otherwise.

C. Install board insulation with joints close and flush, in regular courses, and with end joints staggered.

D. Install batt and blanket insulation with joints tight. Fill framing voids completely. Seal penetrations, terminations, facing joints, facing cuts, tears, and unlapped joints with tape.

E. Fit insulation tight against adjoining construction and penetrations, unless indicated otherwise.

3.3 THERMAL INSULATION

A. Perimeter Insulation In Contact with Soil:

1. Vertical insulation:
   a. Fill joints of insulation with same material used for bonding.
   b. Bond polystyrene board to surfaces with adhesive.
   c. Bond cellular glass insulation to surfaces with hot asphalt or adhesive cement.
2. Horizontal insulation under concrete floor slab:
   a. Lay insulation boards and blocks horizontally on level, compacted and drained fill.
   b. Extend insulation from foundation walls towards center of building minimum 600 mm (24 inches).

B. Exterior Furring Insulation:

1. General:
   a. Open voids are not acceptable.
   b. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
   c. Pack behind outlets, around pipes, ducts, and services encased in walls.
   d. Hold insulation in place with pressure sensitive tape.
   e. Lap facing flanges together over framing for continuous surface. Seal penetrations through insulation and facings.
2. Metal Studs: Fasten insulation between metal studs, framing, and furring with pressure sensitive tape continuous along flanged edges.

C. Inside Face of Exterior Wall Insulation:
1. Location: On interior face of solid masonry and concrete walls, beams, beam soffits, underside of floors, and to face of studs to support interior wall finish where indicated.
2. Bond insulation to solid vertical surfaces with adhesive. Fill joints with adhesive cement.
3. Fasten board insulation to face of studs with screws, nails or staples. Space fastenings maximum 300 mm (12 inches) on center. Stagger fasteners at board joints. Install fasteners at each corner.

3.4 ACOUSTICAL INSULATION

A. General:
1. Install insulation without voids.
2. Pack insulation around door frames and windows, in building expansion joints, door soffits, and other voids.
3. Pack behind outlets, around pipes, ducts, and services encased in walls.
4. Hold insulation in place with pressure sensitive tape.
5. Lap facer flanges together over framing for continuous surface. Seal all penetrations through the insulation and facers.
6. Do not compress insulation below required thickness except where embedded items prevent required thickness.

B. Semi Rigid, Batts and Blankets:
1. When insulation is not full thickness of cavity, adhere insulation to one side of cavity, maintaining continuity of insulation and covering penetrations or embedments.

a. Wood Framing:

1) Fasten blanket insulation between wood framing and joists with nails or staples through flanged edges of insulation.

2) Space fastenings maximum 150 mm (6 inches) on center.

b. Metal Framing:

1) Fasten insulation between metal framing with pressure sensitive tape continuous along flanged edges.

2) At metal framing or ceilings suspension systems, install blanket insulation above suspended ceilings or metal framing at right angles to the main runners or framing.

3) Tape insulation tightly together so no gaps occur and metal framing members are covered by insulation.

C. Sound Deadening Board: Secure with adhesive to masonry and concrete walls and with screws to metal and wood framing. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

3.5 CLEANING

A. Remove excess adhesive before adhesive sets.

3.6 PROTECTION

A. Protect insulation from construction operations.

B. Repair damage.

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SECTION 07 22 00
ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

B. Roof and deck insulation, substrate board, vapor retarder, on existing concrete and metal deck substrates ready to receive roofing or waterproofing membrane.

C. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.

B. Section 06 10 00, ROUGH CARPENTRY: Wood Cants, Blocking, and Edge Strips.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Society of Civil Engineers

ASCE 7-22.....Minimum Design Loads and Associated Criteria for Buildings and Other Structures

C. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):

Standard 90.1-19.....Energy Standard for Buildings Except Low-Rise Residential Buildings.

D. ASTM International (ASTM):

C208-21.....Cellulosic Fiber Insulating Board.

C552-17.....Cellular Glass Thermal Insulation.

C726-19.....Mineral Fiber Roof Insulation Board.

C728-17.....Perlite Thermal Insulation Board.

C1177/C1177M-22.....Glass Mat Gypsum Substrate for Use as Sheathing.

C1278/C1278M-22.....Fiber-Reinforced Gypsum Panel.

C1289-22.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

C1396/C1396M-22.....Gypsum Board.

D41/D41M-21 (2016).....Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

D312/D312M-21.....Asphalt Used in Roofing.

D1970/D1970M-20.....Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

D2178/D2178M-21.....Asphalt Glass Felt Used in Roofing and Waterproofing.

D2822/D2822M-19.....Asphalt Roof Cement, Asbestos Containing.

D4586/D4586M-20.....Asphalt Roof Cement, Asbestos-Free.

E84-23.....Surface Burning Characteristics of Building Materials.

F1667-20.....Driven Fasteners: Nails, Spikes, and Staples.

E. National Roofing Contractors Association (NRCA):

Manual-15.....The NRCA Roofing Manual: Membrane Roof Systems-2020.

F. UL LLC (UL):

Listed Online Certifications Directory.

G. U.S. Department of Agriculture (USDA):

USDA BioPreferred Program Catalog.

H. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

DOC PS 1-19.....Structural Plywood.

DOC PS 2-18.....Performance Standard for Wood-Based Structural-Use Panels.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and installation details.
   a. Nailers, cants, and terminations.
   b. Layout of insulation showing slopes, tapers, penetrations, and edge conditions.

C. Manufacturer's Literature and Data:

1. Description of each product.

D. Samples:

1. Roof insulation, each type.
2. Fasteners, each type.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Biobased Content:
   a. Show type and quantity for each product.
3. Low Pollutant-Emitting Materials:
   a. Show volatile organic compound types and quantities.

F. Qualifications: Substantiate qualifications meet specifications.
1. Installer.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Same installer as Division 07 roofing section installer.

1.6 DELIVERY

A. Comply with recommendations of NRCA Manual.
B. Deliver products in manufacturer's original sealed packaging.
C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Comply with recommendations of NRCA Manual.
B. Store products indoors in dry, weathertight facility.
C. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment: Install products when existing and forecasted weather permit installation according to manufacturer's instructions.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant substrate board, vapor retarder, insulation, and cover board against material and manufacturing defects as part of Division 07 roofing system warranty.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. On existing roofs confirm available insulation thickness and modify as required

B. Insulation Thermal Performance:

1. Overall Average R-Value: RSI-57 (R-33), minimum.
2. Any Location R-Value: RSI-17 (R-10), minimum.

C. Fire and Wind Uplift Resistance: Provide roof insulation complying with requirements specified in Division 07 roofing section.

D. Insulation on Metal Decking: UL labeled indicating compliance with one of the following:

1. UL Listed.
2. Insulation Surface Burning Characteristics: When tested according to ASTM E84.
   a. Flame Spread Rating: 75 maximum.
   b. Smoke Developed Rating: 150 maximum.

2.2 PRODUCTS - GENERAL

A. Provide each product from one manufacturer.

B. Sustainable Construction Requirements:

1. Insulation Recycled Content:

   a. Mineral Fiber: 75 percent total recycled content, minimum.
   b. Fiberglass: 20 percent total recycled content, minimum.
   c. Cellulose: 75 percent post-consumer recycled content, minimum.
   d. Perlite Composite Board: 23 percent post-consumer recycled content, minimum.
   e. Rigid Foam: 9 percent total recycled content, minimum.
   f. Glass Fiber Reinforced Rigid Foam: 6 percent total recycled content, minimum.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.
   b. Composite wood and agrifiber.

3. 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.

2.3 ADHESIVES

A. Primer: ASTM D41/D41M.

B. Asphalt: ASTM D312, Type III or IV for vapor retarders and insulation.

C. Modified Asphaltic Insulation Adhesive: Insulation manufacturer's recommended modified asphaltic, asbestos-free, cold-applied adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

D. Bead-Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended bead-applied, low-rise, one- or multicomponent urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

E. Full-Spread Applied Urethane Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to adhere roof insulation to substrate or to another insulation layer.

F. Roof Cement: Asbestos free, ASTM D2822/D2822M, Type I or Type II; or, ASTM D4586/D4586M, Type I or Type II.

2.4 ROOF AND DECK INSULATION

A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, faced with glass fiber reinforced cellulosic felt facers on both major surfaces of the core foam.

C. Tapered Roof Insulation System:

1. Fabricate of mineral fiberboard, polyisocyanurate, perlite board, or cellular glass. 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 (1-1/2 inch).
4. Minimum slope 1/48 (1/4 inch per 12 inches).

2.5 INSULATION ACCESSORIES

A. Glass (Felt): ASTM D2178/D2178M, Type VI, heavy duty ply sheet.

B. Cants and Tapered Edge Strips:

1. Wood Cant Strips: Refer to Section 06 10 00, ROUGH CARPENTRY.
2. Insulation Cant Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.
3. Tapered Edge Strips: 1/12 (1 inch per 12 inches), 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/D2178M, Type IV, asphalt impregnated.
2. Self-Adhering Sheet Vapor Retarder: ASTM D1970/D1970M, minimum 1.0 mm (40 mils) thick membrane of HDPE film fully coated with asphalt adhesive, or 0.76 to 1.0 mm (30 to 40 mils) thick membrane of butyl rubber based adhesive backed by a layer of high density cross-laminated polyethylene; maximum permeance rating of 6 ng/Pa/s/sq. m (0.1 perms).

D. Substrate Board:

1. Gypsum Board: ASTM C1396/C1396M, 16 mm (5/8 inch) thick, Type X.

2.6 ACCESSORIES

A. Fasteners: Corrosion-resistant carbon steel fasteners and galvalume-coated steel or plastic round plates for fastening substrate board and insulation to roof deck.

B. Nails: ASTM F1667; type to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Comply with requirements of Division 07 roofing section.

3.2 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

3.3 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with requirements of UL for insulated steel roof deck.

C. Attach substrate board and other products to meet requirements of Division 07 roofing section.

3.4 SUBSTRATE BOARD INSTALLATION

A. Fasten substrate board to top flanges of steel decking to resist uplift pressures according requirements for specified roofing system.

1. Locate the long dimension edge joints solidly bearing on top of decking ribs.

3.5 VAPOR RETARDER INSTALLATION

A. Vapor Retarder Installation, 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. Seal penetrations through vapor retarder with roof cement to prevent moisture entry from below.

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.

C. Precast Concrete Unit Decks Without Concrete Topping:

1. Prime deck as specified.
2. Apply two plies of asphalt saturated felt.

3. Mop to deck, keeping bitumen 100 mm (4 inches) away from joints of precast units. Bridge joints with felt. Mop between plies as specified.

3.6 INSULATION INSTALLATION

A. Insulation Installation, General:

1. Base Sheet: Where required by roofing system, install one lapped base sheet specified in Division 07 roofing section by mechanically fastening to roofing substrate before installation of insulation.

2. Cant Strips: Install preformed insulation cant strips at junctures of roofing system with vertical construction.

3. Use same insulation as existing for roof repair and alterations unless specified otherwise.

B. Insulation Thickness:

1. Thickness of roof insulation shown on drawings is nominal. Provide thickness required to comply with specified thermal performance.

2. Insulation on Metal Decks: Provide insulation in minimum thickness recommended by insulation manufacturer to span deck flutes. Support edges of insulation on metal deck ribs.
3. When actual insulation thickness differs from drawings, coordinate alignment and location of roof drains, flashing, gravel stops, fascias and similar items.

4. Where tapered insulation is used, maintain insulation thickness at high points and roof edges shown on drawings.
   a. Low Point Thickness: Minimum 38 mm (1-1/2 inches).
5. Use minimum two layers of insulation when required thickness is 68 mm (2.7 inch) or greater.

C. Lay insulating units with close joints, in regular courses and with end joints staggered.

1. Stagger joints between layers minimum 150 mm (6 inches).

D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.

E. Seal cut edges at penetrations and at edges against blocking with bitumen or roof cement.

F. Cut to fit tightly 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.
2. Mechanically Fastened Insulation:
   a. Fasten insulation according to requirements in Division 07 roofing section.
   b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section and ASCE-7.
3. Mechanically Fastened and Adhered Insulation:
   a. Fasten first layer of insulation according to "Mechanically Fastened Insulation" requirements.
   b. Fasten each subsequent layer of insulation according to "Adhered Insulation" requirements.

3.7 COVER BOARD INSTALLATION

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SECTION 07 53 23
ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ethylene Propylene Diene Monomer (EPDM) sheet roofing adhered to insulated metal roof deck.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.

B. Section 07 01 50.19, PREPARATION FOR REROOFING: Preparation of Existing Membrane Roofs and Repair Areas.

C. Section 07 22 00, ROOF AND DECK INSULATION: Substrate Board, Vapor Retarder, Roof Insulation, and Cover Board.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

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

FX-1-21.....Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

RP-4 2022.....Wind Design Standard for Ballasted Single-ply Roofing Systems.

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

7-22.....Minimum Design Loads For Buildings and Other Structures.

D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

90.1-22.....Energy Standard for Buildings Except Low-Rise Residential Buildings.

E. ASTM International (ASTM):

A276/A276M-24.....Stainless Steel Bars and Shapes.

B209-21a.....Aluminum and Aluminum-Alloy Sheet and Plate.

B209M-21a.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

C67-21.....Sampling and Testing Brick and Structural Clay Tile.

C140/C140M-22b.....Sampling and Testing Concrete Masonry Units and Related Units.

C936/C936M-23a.....Solid Concrete Interlocking Paving Units.

C1371-15R22.....Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

C1549-16(2022).....Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

D751-19.....Standard Test Methods for Coated Fabrics.

D1248-16.....Polyethylene Plastics Extrusion Materials for Wire and Cable.

D1876-08(R2023).....Peel Resistance of Adhesives (T-Peel Test).

D2103-23a.....Polyethylene Film and Sheeting.

D2240-15(2021).....Rubber Property-Durometer Hardness.

D3884-09(2022).....Abrasion Resistance of Textile Fabrics (Rotary Platform, Double-Head Method).

D4263-83(2018).....Indicating Moisture in Concrete by the Plastic Sheet Method.

D4586/D4586M-07(2018)...Asphalt Roof Cement, Asbestos-Free.

D4637/D4637M-15(2021)...EPDM Sheet Used In Single-Ply Roof Membrane.

E96/E96M-21.....Water Vapor Transmission of Materials.

E408-13(2019).....Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

E1918-21.....Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.

E1980-21.....Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.

G21-15.....Resistance of Synthetic Polymeric Materials to Fungi.

F. Cool Roof Rating Council (CRRC):

1-16.....Product Rating Program.

G. Federal Specifications (Fed. Spec.):

UU-B-790A.....Building Paper, Vegetable Fiber: (Kraft, Waterproofed, Water Repellent and Fire Resistant).

H. Florida Department of Business and Professional Regulation (FL): Approved Product Approval.

I. National Roofing Contractors Association (NRCA):
Manual-19.....The NRCA Roofing Manual: Membrane Roof Systems.

J. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog.

K. UL LLC (UL):
580-17..... Tests for Uplift Resistance of Roof Assemblies.
1897-19.....Uplift Tests for Roof Covering Systems.

L. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
DOC PS 1-19.....Structural Plywood.
DOC PS 2-18.....Performance Standard for Wood-Based Structural-Use Panels.

M. U.S. Environmental Protection Agency (EPA):
Energy Star.....ENERGY STAR Program Requirements for Roof Products Version 3.0.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at the Project site minimum 30 days before beginning Work of this section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Contractor.
   c. Installer.
   d. Manufacturer's field representative.
   e. Other installers responsible for adjacent and intersecting work, including roof deck, flashings, roof specialties, roof accessories, utility penetrations, and rooftop curbs and equipment.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

a. Installation schedule.
b. Installation sequence.
c. Preparatory work.
d. Protection before, during, and after installation.
e. Installation.
f. Terminations.
g. Transitions and connections to other work.
h. Inspecting and testing.
i. Other items affecting successful completion.
j. Pull out test of fasteners.
k. Material storage, including roof deck load limitations.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Roofing membrane layout.

2. Roofing membrane seaming and joint details.
3. Roof membrane penetration details.
4. Base flashing and termination details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Minimum fastener pull out resistance.
3. Installation instructions.
4. Warranty.

5. 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. Sustainable Construction Submittals:

1. Solar Reflectance Index (SRI) for roofing membrane.
2. Low Pollutant-Emitting Materials:

a. Show volatile organic compound types and quantities.

3. Energy Star label for roofing membrane.

E. Samples:

1. Roofing Membrane: 150 mm (6 inch) square.

2. Roofing Membrane Seam: 300 mm (12 inches) square.

F. Certificates: Certify products comply with specifications.

1. Fire and windstorm classification.

2. Energy performance requirements.

G. Qualifications: Substantiate qualifications comply with specifications.

1. Installer, including supervisors with project experience list.

2. Manufacturer's field representative with project experience list.

H. Field quality control reports.

I. Temporary protection plan. Include list of proposed temporary materials.

J. Operation and Maintenance Data:

1. Maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.

2. Regularly installs specified products.

3. Installed specified products with satisfactory service on five similar installations for minimum five years.

a. Project Experience List: Provide contact names and addresses for completed projects.

4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.

B. Manufacturer's Field Representative:

1. Manufacturer's full-time technical employee or independent roofing inspector.

2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Comply with NRCA Manual storage and handling requirements.

B. Store products indoors in dry, weathertight facility.

C. Store adhesives according to manufacturer's instructions.

D. Protect products from damage during handling and construction operations.

E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 4 degrees C (40 degrees F) and rising before installation.
2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.

1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Roofing System: Adhered roofing membrane, base flashing, roof insulation, fasteners, substrate boards vapor retarders copings edge metal.

2.2 SYSTEM PERFORMANCE

A. Design roofing system meeting specified performance:

1. Load Resistance: ASCE/SEI 7; Design criteria:as indicated on Drawings.

2. Energy Performance:

a. EPA Energy Star Listed for low-slope roof products.

b. ASTM E1980; Minimum 78 Solar Reflectance Index (SRI).

c. CRRC-1; Minimum 0.70 initial solar reflectance and minimum 0.75 emissivity.

d. Three-Year Aged Performance: Minimum 0.55 solar reflectance tested in according to ASTM C1549 or ASTM E1918, and minimum 0.75 thermal emittance tested in according to ASTM C1371 or ASTM E408.

1) Where tested aged values are not available:

a) Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.

b) Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 watts/square meter/degree K (2.1 BTU/hour/square foot) convection coefficient.

2.3 PRODUCTS - GENERAL

A. Basis of Design: match existing roofing system.

B. Provide roof system components from one manufacturer.

C. Sustainable Construction Requirements:

1. 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.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.

2.4 EPDM ROOFING MEMBRANE

A. EPDM Sheet: ASTM D4637/D4637M, Type II - internally reinforced
   1. Thickness: 1.5 mm (60 mils) 2.54 mm (100 mils).

   2. Color: See Section 09 06 00, SCHEDULE OF FINISHES.

B. Additional Properties:

PROPERTY	TEST METHOD	REQUIREMENT
Shore A Hardness	ASTM D2240	55 to 75 Durometer
Water Vapor Permeance	ASTM E96/E96M	Minimum 8 ng/Pa/s/sq. m (0.14 perms) Water Method
Fungi Resistance	ASTM G21	After 21 days, no sustained growth or discoloration.

   1. Use fire retardant membrane when not protected by ballast or pavers. Verify for UL or approval.

2.5 MEMBRANE ACCESSORY MATERIALS

A. Sheet roofing manufacturer's specified products.

B. Flashing Sheet: Manufacturer's standard; same material, and color as roofing membrane.
   1. Self-curing EPDM flashing adaptable to irregular shapes and surfaces.
   2. Minimum Thickness: 1.5 mm (0.060 inch).

C. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.

D. Splice Adhesive or Tape: Manufacturer's standard for roofing membrane and flashing sheet.

E. Splice Lap Sealant: Liquid EPDM rubber for exposed lap edge.

F. Bonding Adhesive: Manufacturer's standard, water based, to suit substrates.

G. Termination Bars: Manufacturer's standard, stainless steel or aluminum, 25 mm wide by 3 mm thick (1 inch wide by 1/8 inch thick) factory drilled for fasteners.

H. Battens: Manufacturer's standard, galvannealed or galvanized steel, 25 mm wide by 1.3 mm thick (1 inch wide by 0.05 inch thick), factory punched for fasteners.

I. Pipe Compression Clamp:

1. Stainless steel drawband.
2. Worm drive clamp device.

J. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.

K. Fastener Sealer: One part elastomeric adhesive sealant.

L. Temporary Closure Sealers (Night Sealant): Polyurethane two part sealer.

M. Primers, Splice Tapes, Cleaners, and Butyl Rubber Seals: As specified by roof membrane manufacturer.

N. Asphalt Roof Cement: ASTM D4586/D4586M.

2.6 FASTENERS

2.7 SEPARATION SHEET

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.

2.8 FLEXIBLE TUBING

A. Closed cell neoprene, butyl polyethylene, vinyl, or polyethylene tube or rod.

B. Diameter approximately 1-1/2 times joint width.

2.9 WALKWAY PADS

2.10 PROTECTION MAT OR SEPARATOR SHEET

A. Protection Mat:

1. Water pervious; either woven or non-woven 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 an 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 degrees C (40 degrees F) to maximum 66 degrees C (150 degrees F) when exposed to ultraviolet light.
7. Minimum Sheet Width: 2400 mm (8 feet).

2.11 BALLAST

2.12 ROOF PAVERS

2.13 ACCESSORIES

A. Temporary Protection Materials:
   1. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
   2. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine and verify substrate suitability for product installation with roofing installer and roofing inspector present.

   1. Verify roof penetrations are complete, secured against movement,.
   2. Verify roof deck is adequately secured to resist wind uplift.

3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.

B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

A. Complete roof deck construction before beginning roofing work:
   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 roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
   3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.

B. Dry out surfaces including roof deck flutes, that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.

C. Broom clean roof decks. Remove dust, dirt and debris.

D. Remove projections capable of damaging roofing materials.

E. Existing Membrane Roofs and Repair Areas:
   1. Comply with Section 07 01 50.19 PREPARATION FOR REROOFING.

3.3 TEMPORARY PROTECTION

A. 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.

B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.

C. Temporarily seal exposed insulation surfaces within roofing membrane.
   1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 2400 mm (8 feet) on center.

2. Direct water away from work. Provide drainage, preventing water accumulation.
3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.

D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.
1. Cut minimum 150 mm (6 inches) back from sealed edges and surfaces.

E. Remove sandbags and store for reuse.

3.4 INSTALLATION, GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with NRCA Manual installation requirements.

C. Comply with UL 580 for uplift resistance.

D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with EPDM.

3.5 ROOFING INSTALLATION

A. Install membrane perpendicular to long dimension of insulation boards.

B. Begin membrane installation at roof low point and work towards high point. Lap membrane shingled in water flow direction.

C. Position membrane free of buckles and wrinkles.

D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:
1. Allow 30 minutes for membrane to relax before proceeding.
2. Lap edges and ends minimum 75 mm (3 inches). Clean lap surfaces.
3. Install seam adhesive or tape, unless furnished with factory applied adhesive strips. Apply pressure to develop full adhesion.
4. Check seams to ensure continuous adhesion and correct defects.
5. Finish seam edges with beveled bead of lap sealant.
6. Finish seams same day as membrane is installed.

7. Anchor membrane perimeter to roof deck and parapet wall as indicated on drawings.

E. Membrane Perimeter Anchorage:
   1. Install batten with fasteners at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.

F. Adhered System Installation:
   1. Apply bonding adhesive in quantities required by roofing membrane manufacturer.
   2. Fold sheet back on itself, clean and coat the bottom side of the membrane and the top of substrate with adhesive. Do not coat the lap joint area.
   3. After adhesive has set according to adhesive manufacturer's instructions, roll roofing membrane into adhesive minimizing voids and wrinkles.
   4. Repeat for other half of sheet.
   5. Cut voids and wrinkles to lay flat. Clean and patch cut area.

3.6 FLASHING INSTALLATION

A. Install flashings on same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.

B. Installing Base Flashing and Pipe Flashing:
   1. Install flashing sheet to pipes, walls and curbs to minimum 200 mm (8 inches) height above roof surfaces and extend roofing manufacturer's standard lap dimension onto roofing membranes.
      a. Adhere flashing with bonding adhesive.
      b. Form inside and outside corners of flashing sheet according to NRCA Manual. Form pipe flashing according to NRCA Manual.
      c. Lap ends roofing manufacturer's standard dimension.
      d. Adhesively splice flashing sheets together, and adhesively splice flashing sheets to roofing membranes. Finish exposed edges with lap sealant.

2. Anchor top of flashing to walls and curbs with fasteners spaced maximum 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.

C. Repairs to Membrane and Flashings:

1. Remove sections of roofing membrane or flashing sheet that are creased, wrinkled, or fishmouthed.
2. Cover removed areas, cuts and damaged areas with patch extending 100 mm (4 inches) beyond damaged, cut, or removed area. Adhesively splice patch to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

3.8 BALLAST AND PAVER INSTALLATION

3.9 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
2. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
3. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through seams where directed by Contracting Officer's Representative.
4. Cut one sample for every 450 meter (1500 feet) of seams.
5. Cut samples perpendicular to seams.
6. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.
7. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
8. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 100 mm (4 inches) beyond cut.

B. Manufacturer Services:

1. Inspect initial installation, installation in progress, and completed work.
2. Issue supplemental installation instructions necessitated by field conditions.
3. Prepare and submit inspection reports.
4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.10 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance.

3.11 PROTECTION

A. Protect roofing system from traffic and construction operations.
   1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
   2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

B. Loose lay temporary insulation board overlaid with plywood or OSB.
   1. Weight boards to secure against wind uplift.

C. Remove protection when no longer required when directed by Contacting Officer's Representative.

D. Repair damage.

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SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Non-Flooring Adhesives and Sealants VOC Limits.

B. Section 07 01 50.19, PREPARATION FOR REROOFING: Preparation of Existing Membrane Roofs and Repair Areas.

C. Section 07 22 00, ROOF AND DECK INSULATION: Roof Insulation.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

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

FX-1-16.....Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):

7-16.....Minimum Design Loads for Buildings and Other Structures.

D. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

90.1-19.....Energy Standard for Buildings Except Low-Rise Residential Buildings.

E. ASTM International (ASTM):

C67-20.....Sampling and Testing Brick and Structural Clay Tile.

C140/C140M-21.....Sampling and Testing Concrete Masonry Units and Related Units.

C1371-15.....Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.

C1549-16.....Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer.

D1876-23.....Peel Resistance of Adhesives (T-Peel Test).

D4263-83(2018).....Indicating Moisture in Concrete by the Plastic Sheet Method.

D4434/D4434M-21.....Poly(Vinyl Chloride) Sheet Roofing.

D6878/D6878M-21.....Thermoplastic Polyolefin Based Sheet Roofing.

E408-13(2019).....Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.

E1918-21.....Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field.

E1980-11(2019).....Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

F. Cool Roof Rating Council (CRRC):

1-21.....Product Rating Program.

G. National Roofing Contractors Association (NRCA):

Manual-19.....The NRCA Roofing Manual: Membrane Roofing Systems.

H. U.S. Department of Agriculture (USDA):

BioPreferred® Program Catalog.

I. UL LLC (UL):

580-19.....Tests for Uplift Resistance of Roof Assemblies.

1897-23.....Uplift Tests for Roof Covering Systems.

J. U.S. Department of Commerce National Institute of Standards and Technology (NIST):

DOC PS 1-22.....Structural Plywood.

DOC PS 2-18.....Performance Standard for Wood-Based Structural-Use Panels.

K. U.S. Environmental Protection Agency (EPA):

Energy Star.....ENERGY STAR Program Requirements for Roof Products Version 3.0.

1.4 PREINSTALLATION MEETINGS

A. Conduct pre-installation meeting at project site minimum 30 days before beginning Work of this section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Contractor.
   c. Installer.
   d. Manufacturer's field representative.
   e. Other installers responsible for adjacent and intersecting work, including roof deck, flashings, roof penetrations, roof accessories, utility penetrations, rooftop curbs and equipment.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
   a. Installation schedule.
   b. Installation sequence.
   c. Preparatory work.
   d. Protection before, during, and after installation.
   e. Installation.
   f. Terminations.
   g. Transitions and connections to other work.
   h. Inspecting and testing.
   i. Other items affecting successful completion.
   j. Pullout test of fasteners.
   k. Material storage, including roof deck load limitations.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
   1. Roof membrane layout.
   2. Roofing membrane seaming and joint details.
   3. Roof membrane penetration details.
   4. Base flashing and termination details.
   5. Paver layout.
   6. Paver anchoring locations and details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Minimum fastener pullout resistance.
3. Installation instructions.
4. Warranty.

D. Samples:
1. Roofing Membrane: 150 mm (6 inch) square.
2. Base Flashing: 150 mm (6 inch) square.
3. Fasteners: Each type.
4. Roofing Membrane Seam: 300 mm (12 inches) square.

E. Sustainable Construction Submittals:

1. Solar Reflectance Index (SRI) for roofing membrane.
2. Biobased Content:
a. Show type and quantity for each product.
3. Low Pollutant-Emitting Materials:
a. Show volatile organic compound types and quantities.
4. Energy Star label for roofing membrane.

F. Certificates: Certify products comply with specifications.
1. Fire and windstorm classification.

2. Energy performance requirements.

G. Qualifications: Substantiate qualifications comply with specifications.
1. Installer, including supervisors with project experience list.
2. Manufacturer's field representative with project experience list.

H. Field quality control reports.

I. Temporary protection plan. Include list of proposed temporary materials.

J. Operation and Maintenance Data:
1. Maintenance instructions.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
1. Approved by roofing system manufacturer as installer for roofing system with specified warranty.
2. Regularly installs specified products.

3. Installed specified products with satisfactory service on five similar installations for minimum five years.
   a. Project Experience List: Provide contact names and addresses for completed projects.
4. Employs full-time supervisors experienced installing specified system and able to communicate with Contracting Officer's Representative and installer's personnel.

B. Manufacturer's Field Representative:
1. Manufacturer's full-time technical employee or independent roofing inspector.
2. Individual certified by Roof Consultants Institute as Registered Roof Observer.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Comply with NRCA Manual storage and handling requirements.
B. Store products indoors in dry, weathertight facility.
C. Store adhesives according to manufacturer's instructions.
D. Protect products from damage during handling and construction operations.
E. Products stored on the roof deck must not cause permanent deck deflection.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 4 degrees C (40 degrees F) for minimum 48 hours before installation.
2. Weather Limitations: Install roofing only during dry current and forecasted weather conditions.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant roofing system against material and manufacturing defects and agree to repair any leak caused by a defect in the roofing system materials or workmanship of the installer.
   1. Warranty Period: 10 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Roofing System: Thermoplastic Polyolefin (TPO) sheet roofing adhered to roof deck.

2.2 SYSTEM PERFORMANCE

A. Design roofing system complying with specified performance:
   1. Load Resistance: ASCE/SEI 7; Design criteria: TO MATCH EXISTING

   2. Energy Performance:

      a. EPA Energy Star Listed for low-slope roof products.

      b. ASTM E1980; Minimum 78 Solar Reflectance Index (SRI).

      c. CRRC-1; Minimum 0.70 initial solar reflectance and minimum 0.75 emissivity.

      d. Three-Year Aged Performance: Minimum 0.55 solar reflectance tested in according to ASTM C1549 or ASTM E1918, and minimum 0.75 thermal emittance tested in according to ASTM C1371 or ASTM E408.
         1) Where tested aged values are not available:
            a) Calculate compliance adjusting initial solar reflectance according to ASHRAE 90.1.
            b) Provide roofing system with minimum 64 three-year aged Solar Reflectance Index calculated according to ASTM E1980 with 12 W/square meter/degree K (2.1 BTU/hour/square foot) convection coefficient.

2.3 PRODUCTS - GENERAL

A. Provide roof system components from one manufacturer.

B. Sustainable Construction Requirements:

1. Solar Reflectance Index: 78 minimum.

2. Biobased Content: 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.

3. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.

2.4 TPO ROOFING MEMBRANE

1. TPO Sheet: ASTM D6878/D6878M, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick, with no backing.

2.5 MEMBRANE ACCESSORY MATERIALS

A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.

B. Factory Formed Flashings: Inside and outside corners, pipe boots, and other special flashing shapes to minimize field fabrication.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Metal Termination Bars: Manufacturer's standard, stainless-steel or aluminum, 25 mm wide by 3 mm thick (1-inch wide by 1/8 inch thick) factory drilled for fasteners.

E. Battens: Manufacturer's standard, galvannealed or galvanized steel sheet, 25 mm wide by 1.3 mm thick (1-inch wide by 0.05 inch thick), factory punched for fasteners.

F. Fasteners: Manufacturer's standard coated steel with metal or plastic plates, to suit application.

G. Primers, Sealers, T-Joint Covers, Lap Sealants, and Termination Reglets: As specified by roof membrane manufacturer.

H. 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.

2.6 WALKWAY PADS

2.7 ROOF PAVERS

2.8 ACCESSORIES

A. Temporary Protection Materials:

1. Plywood: NIST DOC PS 1, Grade CD Exposure 1.
2. Oriented Strand Board (OSB): NIST DOC PS 2, Exposure 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine and verify substrate suitability with roofing Installer and roofing inspector present.

1. Verify roof penetrations are complete, secured against movement,.
2. Verify roof deck is adequately secured to resist wind uplift.
3. Verify roof deck is clean, dry, and in-plane ready to receive roofing system.

B. Correct unsatisfactory conditions before beginning roofing work.

3.2 PREPARATION

A. Complete roof deck construction before beginning roofing work:

1. Curbs, blocking, edge strips, nailers, cants, and other components to which insulation, roofing, and base flashing is attached in place ready to receive insulation and roofing.
2. Coordinate roofing membrane installation with flashing work and roof insulation work so insulation and flashing are installed concurrently to permit continuous roofing operations.
3. Complete installation of flashing, insulation, and roofing in same day except for the area where temporary protection is required when work is stopped for inclement weather or end of work day.

B. Dry out surfaces that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates, only.

C. Broom clean roof decks. Remove dust, dirt and debris.

D. Remove projections capable of damaging roofing materials.

E. Concrete Decks, except Insulating Concrete:
   1. Test concrete decks for moisture according to ASTM D4263 before installing roofing materials.
   2. Prime concrete decks. Keep primer back 100 mm (4 inches) from precast concrete deck joints.
   3. Allow primer to dry before application of bitumen.

F. Existing Membrane Roofs and Repair Areas:
   1. Comply with requirements in Section 07 01 50.19 PREPARATION FOR REROOFING.

3.3 TEMPORARY PROTECTION

A. 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.

B. Install temporary cap flashing over top of base flashings where permanent flashings are not in place to protect against water intrusion into roofing system. Securely anchor in place to prevent blow off and damage by construction activities.

C. Temporarily seal exposed insulation surfaces within roofing membrane.
   1. Apply temporary seal and water cut off by extending roofing membrane beyond insulation and securely embedding edge of the roofing membrane in 6 mm (1/4 inch) thick by 50 mm (2 inches) wide strip of temporary closure sealant. Weight roofing membrane edge with sandbags, to prevent displacement; space sandbags maximum 2400 mm (8 feet) on center.
   2. Direct water away from work. Provide drainage, preventing water accumulation.
   3. Check daily to ensure temporary seal remains watertight. Reseal open areas and weight down.

D. Before the work resumes, cut off and discard portions of roof membrane in contact with temporary seal.
   1. Cut minimum 150 mm (6 inches) back from sealed edges and surfaces.

E. Remove sandbags and store for reuse.

3.4 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Comply with NRCA Manual installation requirements.

C. Comply with UL 580 for uplift resistance.

D. Do not allow membrane and flashing to contact surfaces contaminated with asphalt, coal tar, oil, grease, or other substances incompatible with TPO.

3.5 ROOFING INSTALLATION

A. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.

B. Begin installation at the low point of the roof and work towards the high point. Lap membrane shingled in water flow direction.

C. Position the membrane free of buckles and wrinkles.

D. Roll membrane out; inspect for defects as membrane is unrolled. Remove defective areas:

1. Lap edges and ends of sheets 50 mm (2 inches) or more as recommended by the manufacturer.
2. Heat weld laps. Apply pressure as required. Seam strength of laps as required by ASTM D4434/D4434M.
3. Check seams to ensure continuous adhesion and correct defects.
4. Finish seam edges with beveled bead of lap sealant.
5. Finish seams same day as membrane is installed.
6. Anchor membrane perimeter to roof deck or parapet wall as indicated on drawings.
7. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
8. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (4 inches) beyond cut.

E. Membrane Perimeter Anchorage:

1. Install batten at perimeter of each roof area, curb flashing, expansion joints and similar penetrations on top of roof membrane as indicated on drawings.
2. Mechanically Fastening:

a. Space fasteners maximum 300 mm (12 inches) on center, starting 25 mm (1 inch) from ends.
b. When battens are cut, round edges and corners before installing.
c. After mechanically fastening strip cover and seal strip with a 150 mm (6 inch) wide roof membrane strip; heat weld to roof membrane and seal edges.
d. At fascia-cants turn roofing membrane down over front edge of the blocking, cant, or nailer. Secure roofing membrane to vertical portion of nailer; or, if required by the membrane manufacturer, with fasteners spaced maximum 150 mm (6 inches) on centers.
e. At parapet walls intersecting building walls and curbs, secure roofing membrane to structural deck with fasteners 150 mm (6 inches) on centers or as shown in NRCA manual.

F. 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 substrate with adhesive. Do not coat the lap joint area.
3. After adhesive has set according to adhesive manufacturer's instruction, roll roofing membrane into adhesive minimizing voids and wrinkles.
4. Repeat for other half of sheet.

3.6 FLASHING INSTALLATION

A. Install flashings same day as roofing membrane is installed. When flashing cannot be completely installed in one day, complete installation until flashing is watertight and provide temporary covers or seals.

B. Installing Base Flashing and Pipe Flashing:
1. Install flashing sheet to pipes, wall or curbs to minimum200 mm (8 inches) above roof surfaces and extending roofing manufacturer's standard lap dimension onto roofing membranes.
a. Adhere flashing with bonding adhesive.

b. Form inside and outside corners of flashing sheet according to NRCA manual. Form pipe flashing according to NRCA manual.
c. Lap ends roofing manufacturer's standard dimension.
d. Heat weld flashing membranes together and flashing membranes to roofing membranes. Finish exposed edges with lap sealant.
e. Install flashing membranes according to NRCA manual.

2. Anchor top of flashing to walls and curbs with fasteners spaced maximum150 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.

C. Repairs to Membrane and Flashings:

1. Remove sections of roofing membrane or flashing that are 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. Heat weld to roofing membrane or flashing sheet. Finish edge of lap with lap sealant.

3.7 WALKWAY PAD INSTALLATION

3.8 PAVER INSTALLATION

3.9 FIELD QUALITY CONTROL

A. Field Tests: Performed by testing laboratory specified in Section 01 45 29, TESTING LABORATORY SERVICES.

1. Examine and probe roofing membrane and flashing seams in presence of Contracting Officer's Representative and Manufacturer's field representative.
2. Probe seams to detect marginal bonds, voids, skips, and fishmouths.
3. Cut 100 mm (4 inch) wide by 300 mm (12 inch) long samples through seams where directed by Contracting Officer's Representative.
4. Cut one sample for every 450 m (1500 feet) of seams.
5. Cut samples perpendicular to seams.
6. Failure of samples to pass ASTM D1876 test will be cause for rejection of work.

7. Repair areas where samples are taken and where marginal bond, voids, and skips occur.
8. Repair fishmouths and wrinkles by cutting to lay flat. Install patch over cut area extending 100 mm (4 inches) beyond cut.

B. Manufacturer Services:

1. Inspect initial installation, installation in progress, and completed work.
2. Issue supplemental installation instructions necessitated by field conditions.
3. Prepare and submit inspection reports.
4. Certify completed installation complies with manufacturer's instructions and warranty requirements.

3.10 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed roofing surfaces. Remove contaminants and stains to comply with specified solar reflectance performance.

3.11 PROTECTION

A. Protect roofing system from traffic and construction operations.

1. Protect roofing system when used for subsequent work platform, materials storage, or staging.
2. Distribute scaffolding loads to exert maximum 50 percent roofing system materials compressive strength.

B. Loose lay temporary insulation board overlaid with plywood or OSB.

1. Weight boards to secure against wind uplift.

C. Remove protective materials immediately before acceptance.

D. Repair damage.

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01-01-21

SECTION 07 60 00
FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 DESCRIPTION

A. 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. Section 07 53 23 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING Membrane base flashings and stripping.

B. Section 07 54 23 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING: Membrane base flashings and stripping.

C. Section 07 71 00 ROOF SPECIALTIES: Manufactured flashing, copings, roof edge metal, and fasciae.

D. Section 07 71 00, ROOF SPECIALTIES: Integral flashing components of manufactured roof specialties and accessories or equipment.

E. Section 07 72 00, ROOF ACCESSORIES: Integral flashing components of manufactured roof specialties and accessories or equipment.

F. Division 07 ROOFING AND WALL SYSTEM: Flashing components of factory finished roofing and wall systems.

G. Section 07 92 00, JOINT SEALANTS: Joint Sealants.

H. Section 09 91 00, PAINTING: Paint materials and application.

I. Division 22, PLUMBING: Integral flashing components of manufactured roof specialties and accessories or equipment.

J. Section 22 14 00, FACILITY STORM DRAINAGE: Flashing of Roof Drains.

K. Division 23 HVAC: Integral flashing components of manufactured roof specialties and accessories or equipment.

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/Factory Mutual (ANSI/SPRI/FM):

4435/ES-1-22.....Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems

D. American Architectural Manufacturers Association (AAMA):

AAMA 620-02.....Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum

AAMA 621-02.....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-23a.....Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A653/A653M-23.....Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process

B32-20.....Solder Metal

B209-21.....Aluminum and Aluminum-Alloy Sheet and Plate

B370-22.....Copper Sheet and Strip for Building Construction

D173/D173M-21.....Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing

D412-19.....Vulcanized Rubber and Thermoplastic Elastomers-Tension

D1187/D1187M-17.....Asphalt Base Emulsions for Use as Protective Coatings for Metal

D1784-20.....Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

D3656/D3656M-20.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns

D4586/D4586M-20.....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 Commission (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: 0.48 to 0.96 kPa (10 to 20 pound force/square foot): 1.92-kPa (40 pound force/square foot) perimeter uplift force, 2.87-kPa (60 pound force/square foot pound force/square foot) corner uplift force, and 0.96-kPa (20- pound force/square foot) outward force.
2. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 pound force/square foot): 2.87-kPa (60 pound force/square foot) perimeter uplift force, 4.31-kPa (90 pound force/square foot) corner uplift force, and 1.44-kPa (30 pound force/square foot) outward force.
3. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 pound force/square foot): 4.31-kPa (90 pound force/square foot) perimeter uplift force, 5.74-kPa (120 pound force/square foot) corner uplift force, and 2.15-kPa (45 pound force/square foot) outward force.

4. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 pound force/square foot): 9.96-kPa (208 pound force/square foot) perimeter uplift force, 14.94-kPa (312 pound force/square foot) corner uplift force, and 4.98-kPa (104 pound force/square foot) outward force.

B. Wind Design Standard: Fabricate and install copings tested per ANSI/SPRI/FM 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
   2. Copings
   3. Gravel Stop-Fascia
   4. Gutter and Conductors
   5. Expansion joints
   6. Fascia-cant

C. Manufacturer's Literature and Data: For all specified items, including:
   1. Two-piece counterflashing
   2. Thru wall flashing
   3. Expansion joint cover, each type
   4. Nonreinforced, elastomeric sheeting
   5. Copper clad stainless steel
   6. Polyethylene coated copper
   7. Bituminous coated copper
   8. Copper covered paper
   9. 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. Stainless Steel: ASTM A240, Type 302B, dead soft temper.

B. Copper ASTM B370, cold-rolled temper.

C. Bituminous Coated Copper: Minimum copper ASTM B370, weight not less than 1 kg/m² (3 oz/sf). Bituminous coating shall weigh not less than 2 kg/m² (6 oz/sf); or, copper sheets may be bonded between two layers of coarsely woven bitumen-saturated cotton fabric ASTM D173. Exposed fabric surface shall be crimped.

D. Copper Covered Paper: Fabricated of electro-deposit pure copper sheets ASTM B 370, bonded with special asphalt compound to both sides of creped, reinforced building paper, UU-B-790, Type I, style 5, or to a three ply sheet of asphalt impregnated crepe paper. Grooves running along the width of sheet.

E. Polyethylene Coated Copper: Copper sheet ASTM B370, weighing 1 Kg/m² (3 oz/sf) bonded between two layers of (two mil) thick polyethylene sheet.

F. 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.

G. Galvanized Sheet: ASTM, A653.

H. 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. Solder: ASTM B32; flux type and alloy composition as required for use with metals to be soldered.

B. Rosin Paper: Fed-Spec. UU-B-790, Type I, Grade D, Style 1b, Rosin-sized sheathing paper, weighing approximately 3 Kg/10 m²(6 pounds/100 square feet).

C. Bituminous Paint: ASTM D1187, Type I.

D. 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.

E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.

F. Insect Screening: ASTM D3656, 18 by 18 regular mesh.

G. 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. Copper: 30g (10 oz) minimum 0.33 mm (0.013 inch thick).
2. Stainless steel: 0.25 mm (0.010 inch) thick.
3. Copper clad stainless steel: 0.25 mm (0.010 inch) thick.
4. Galvanized steel: 0.5 mm (0.021 inch) thick.

C. Exposed Locations:
1. Copper: 0.4 Kg (16 oz).
2. Stainless steel: 0.4 mm (0.015 inch).
3. Copper clad 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, copper, stainless steel and copper clad stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
2. Jointing of copper over 0.5 Kg (20 oz) weight or stainless steel over 0.45 mm (0.018 inch) thick shall be done by lapping, riveting and soldering.

3. 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.
4. Flat and lap joints shall be made in direction of flow.
5. Edges of bituminous coated copper, copper covered paper, 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 uncoated copper, stainless steel, and copper clad 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 copper, stainless steel, and copper clad 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 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 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.
3. Where copper gravel stops, copings and flashings will carry water onto cast stone, stone, or architectural concrete, or stainless steel.

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. Copper: Mill finish.
2. Stainless Steel: Finish No. 2B or 2D.
3. 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.

4. Steel and Galvanized Steel:
   a. Finish painted under Section 09 91 00, PAINTING unless specified as prefinished item.
   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. Either copper, stainless steel, or copper clad 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.

D. Lintel Flashing:
   1. Use either copper, stainless steel, copper clad stainless-steel plane flat sheet, or nonreinforced elastomeric sheeting, bituminous coated copper, copper covered paper, or polyethylene coated copper.
   2. Fabricate flashing at ends with folded corners to turn up 5 mm (3/16 inch) in first vertical masonry joint beyond masonry opening.
   3. Turn up back edge as shown.
   4. Form exposed portion with drip as specified or receiver.

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 either copper, or 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. Either copper or 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 GRAVEL STOPS

2.10 BITUMEN STOPS

2.11 HANGING GUTTERS

2.12 CONDUCTORS (DOWNSPOUTS)

2.13 SPLASHPANS

2.14 REGLETS

2.15 INSULATED EXPANSION JOINT COVERS

2.16 ENGINE EXHAUST PIPE OR FLUE OR STACK FLASHING

2.17 SCUPPERS

2.18 GOOSENECK ROOF VENTILATORS

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 top of concrete foundation walls and 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).

B. Flashing at Top of Concrete Foundation Walls Where concrete is exposed. Turn up not less than 200 mm (8 inch) high and into masonry backup mortar joint or reglet in concrete backup as specified.

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, hem top 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.

F. Lintel Flashing when not part of shelf angle flashing:
   1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
   2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
   3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

G. Window Sill Flashing:
   1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
   2. Turn back edge up to terminate under window frame.
   3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

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

3.6 GRAVEL STOPS

3.7 COPINGS

A. General:
1. On walls topped with a wood plank, install a continuous edge strip on the front and rear edge of the plank. Lock the coping to the edge strip with a 19 mm (3/4 inch) loose lock seam.
2. Where shown turn down roof side of coping and extend down over base flashing as specified for counter-flashing. Secure counter-flashing to lock strip in coping at continuous cleat.
3. Install ends adjoining existing construction so as to form space for installation of sealants. Sealant is specified in Section 07 92 00, JOINT SEALANTS.

B. Aluminum Coping:
1. Install with 6 mm (1/4 inch) joint between ends of coping sections.
2. Install joint covers, centered at each joint, and securely lock in place.

3.8 EXPANSION JOINT COVERS, INSULATED

3.9 ENGINE EXHAUST PIPE OR STACK FLASHING

3.10 HANGING GUTTERS

3.11 CONDUCTORS (DOWNSPOUTS)

3.12 SPLASH PANS

3.13 GOOSENECK ROOF VENTILATORS

- - - E N D - - -

01-01-21

SECTION 07 71 00
ROOF SPECIALTIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies copings, gravel stops, fascias, and expansion joints.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 07 21 13, THERMAL INSULATION: General Insulation.

C. Section 07 22 00, ROOF AND DECK INSULATION: Rigid Insulations for Roofing.

D. Section 07 92 00, JOINT SEALANTS: Sealant Material and Installation.

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 classification per drawings. 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-23a.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-23.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A666-21.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

B209-21.....Aluminum and Aluminum Alloy-Sheet and Plate

B209M-21.....Aluminum and Aluminum Alloy-Sheet and Plate (Metric)

B221-21.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-21.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

B32-20.....Solder Metal

B370-22.....Copper Sheet and Strip for Building Construction

B882-20.....Pre-Patinated Copper for Architectural Applications

C612-21.....Mineral Fiber Block and Board Thermal Insulation

D1187/D1187M-17.....Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D1970/D1970M-22.....Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection

D226/D226M-22.....Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing

D4869/D4969M-21.....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):

2605-19.....High Performance Organic Coatings on Architectural Extrusions and Panels.

611-18.....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. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.

D. Insulation: ASTM C612, Class 1 or 2.

E. 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 SOLDER

2.4 COPINGS

A. Fabricate of aluminum sheet not less than 0.08 0.125 inch) thick;

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: Two-coat fluoropolymer Color as specified.

2.5 EXTRUDED ALUMINUM GRAVEL STOPS AND FASCIAS

2.6 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 sizeswith not less than 305 mm (12 inch) leg lengths.

2.7 EXTRUDED ALUMINUM ROOF EXPANSION JOINT COVERS

2.8 FINISH:

A. In accordance with NAAMM AMP 500-505.

B. Aluminum, Clear Anodic Finish AAMA 611: AA-M12C22A41, Class I, 0.017 mm (0.7 mil) thick (min.).

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.
   2. 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. Coordinate to install insulation where shown; see Section 07 21 13, THERMAL INSULATION and Section 07 22 00, ROOF AND DECK INSULATION.

G. Comply with section 07 92 00, JOINT SEALANTS to install sealants where required by manufactures installation instructions.

H. Coordinate with roofing work for installation of items in sequence to prevent water infiltration.

I. 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.

J. 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.

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. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 07 21 13, THERMAL INSULATION: General insulation.

C. Section 07 22 00, ROOF AND DECK INSULATION: Rigid insulations for roofing.

D. Section 07 92 00, JOINT SEALANTS: Sealant material and installation.

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. ASTM International (ASTM):

A653/A653M-23.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process

B209-21.....Aluminum and Aluminum-Alloy Sheet and Plate

B209M-21.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

C726-16.....Mineral Wool Roof Insulation Board

C1289-22.....Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

D1187/D1187M-17...Asphalt-Base Emulsions for Use as Protective Coatings for Metal

C. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06 Series.....Metal Finishes Manual

D. American Architectural Manufacturers Association (AAMA):

2603-20.....Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix).

2605-20.....Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Architectural Extrusions and Panels (with Coil Coating Appendix).

611-18.....Anodized Architectural Aluminum

621-16.....High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates

E. American Society of Civil Engineers (ASCE):

ASCE/SEI 7-22.....Minimum Design Loads and Associated Criteria for Buildings and Other Structures

F. U.S. Occupational Safety and Health Standards (OSHA):
29 CFR 1910 Subpart D... Walking-Working Surfaces (1910.21-1910.30)

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. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 30 percent.

E. Asphalt Coating: ASTM D1187/D1187M, Type I, quick setting.

2.2 ROOF HATCH (SCUTTLE)N/A

2.3 EQUIPMENT SUPPORTS

A. Supported Load Capacity: SEE DRAWINGS

B. 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, and deck closures for curbs installed on steel decking.

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.

I. 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.

J. 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.

K. Finish: SEE DRAWINGS; color SEE DRAWINGS.

2.4 LOW SILHOUETTE GRAVITY VENTILATORS

2.5 METAL GRATING ROOF WALKWAY SYSTEM

2.6 FINISH:

A. In accordance with NAAMM AMP 500 Series.

B. Aluminum, Mill Finish: AA-MIX, as fabricated.

C. Aluminum, Clear Finish AAMA 611: AA-M12C22A41 medium matte, clear anodic coating, Class I, Architectural, 0.018 mm (0.7 mils) thick (min.). AA-M12C22A31 Class II, Architectural, 0.010 mm (0.4 mils) thick (min.).

D. Aluminum Colored Finish AAMA 611: AA-C22A42 (anodized or AA-M12C22A44 (electrolytically deposited metallic compound) medium matte, integrally colored coating, Class 1, Architectural, 0.018 mm (0.7 mils) thick (min.). AA-M12C22A32/A33 Class II, Architectural, 0.010 mm (0.4 mils) thick (min.). Dyes will not be accepted.

E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 0.04 mm (1.5 mils). Comply with coating manufacturer’s written instructions for cleaning, conversion coating, and applying and baking finish.

F. Fluoropolymer Finish: High performance organic coating. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer’s written instructions.

1. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.
2. Two-Coat Fluoropolymer Finish: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

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; see Section 07 21 13, THERMAL INSULATION and 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.

3.3 ADJUSTING

A. Adjust roof hatch hardware to operate freely and so that cover will operate without binding, close tightly at perimeter, and latch securely.

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 81 00
APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies spray-applied cementitious coverings to provide fire resistance to interior structural steel members shown. Sprayed-applied mineral fiber fireproofing is not permitted.

1.2 RELATED WORK:

A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

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. Testing laboratory accreditations.

E. Manufacturer's Literature and Data:

1. Manufacturer's complete and detailed application instructions and specifications.
2. Manufacturer's repair and patching instructions.

F. Certificates:

1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
   a. List thickness and density of material required to meet fire ratings.
   b. Accompanied by complete test report and test record.
2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.

G. Miscellaneous:

1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
2. Manufacturer's written approval of completed installation.

3. Manufacturer's written approval of the applicators of fireproofing material.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver to job-site in sealed containers marked and labeled to show manufacturer's name and brand and UL certification markings of compliance with the specified requirements.

B. Remove damaged or opened containers from the site.

C. Store the materials off the ground, under cover, away from damp surfaces.

D. Keep dry until ready for use.

E. Remove materials that have been exposed to water before installation from the site.

1.4 FIELD CONDITIONS:

A. Temperature: Do not apply fireproofing when substrate or ambient temperature is below 4 degrees C (40 degrees F) unless temporary protection and heat are provided to maintain temperature at or above stated value during application and for 24 hours before and after application.

B. Humidity: Maintain relative humidity levels within limits recommended by fireproofing manufacturer.

C. Ventilation: Provide ventilation to properly dry the fireproofing after application. Provide a minimum of four (4) air exchanges per hour by forced air circulation. When permitted by Contracting Officer Representative (COR), ventilate by natural circulation.

1.5 QUALITY ASSURANCE:

A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer’s products according to specified requirements. Submit manufacturer’s certification that each installer is trained and qualified to install the specified fireproofing. Submit evidence that each installer has a minimum of three (3) years’ experience and a minimum of four (4) installations using the specified fireproofing.

B. Testing Laboratory Accreditation Requirements: Construction materials testing laboratories must be accredited by a laboratory accreditation

authority. Submit a copy of the Certificate of Accreditation and Scope of Accreditation.

C. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.

D. Manufacturer's inspection and approval of surfaces to receive fireproofing.

E. Manufacturer's approval of fireproofing applications.

F. Manufacturer's approval of completed installation.

G. Manufacturer's representative is to observe and advise at the commencement of application, and is required to visit the site as required thereafter for the purpose of ascertaining proper application.

H. Pre-Application Test Area.

1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 4.5 m (15 feet) of beam and deck.
   a. Apply to one (1) column.
   b. Apply for the hourly ratings required in the construction documents.
2. Install in location selected by the COR, for approval by the representative of the fireproofing material manufacturer and the COR.
3. Perform Bond test for cohesive and adhesive strength in accordance with ASTM E736 for each applied fireproofing design used.
4. Perform density test in accordance with ASTM E736 for each applied fireproofing design used.
5. Do not proceed in other areas until installation of test area has been completed and approved.
6. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

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):

C841-18.....Installation of Interior Lathing and Furring

C847-18.....Metal Lath

E84-22.....Surface Burning Characteristics of Building Materials

E119-23.....Fire Tests of Building Construction and Materials

E605-22.....Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members

E736-22.....Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

E759-22.....The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members

E760-22.....Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members

E761-22.....Compressive Strength of Fire-Resistive Material Applied to Structural Members

E859-22.....Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members

E937-22.....Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members

E1042-21.....Acoustically, Absorptive Materials Applied by Trowel or Spray.

G21-21.....Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Underwriters Laboratories, Inc. (UL):

Fire Resistance Directory...Latest Edition including Supplements

D. Warnock Hersey (WH):

Certification Listings..Latest Edition

E. Factory Mutual System (FM):

Approval Guide.....Latest Edition including Supplements

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 SPRAYED-ON FIREPROOFING:

A. ASTM E1042, Class (a), Category A.

1. Factory mixed cementitious materials with approved aggregate.

B. Materials containing asbestos are not permitted.

C. Fireproofing characteristics when applied in the thickness and density required to achieve the fire-rating specified.

	Characteristic	Test	Results
1.	Deflection	ASTM E759	No cracking, spalling, or delamination when backing to which it is applied has a deflection up to 1/120 in 3 m (10 ft.)
2.	Corrosion-Resistance	ASTM E937	No promotion of corrosion of steel.
3.	Bond Impact	ASTM E760	No cracking, spalling, or delamination.
4.	Cohesion/Adhesion (Bond Strength)	ASTM E736	Minimum cohesive/adhesive strength of 9.57 kPa (200 lbf per sq. ft.) for protected areas. 19.15 kPa (400 lbf per sq. ft.) for exposed areas.
5.	Air Erosion	ASTM E859	Maximum gain weight of the collecting filter 0.27 gm per sq. meter (0.025 gm per sq. ft.).
6.	Compressive Strength	ASTM E761	Minimum compressive strength 48 kPa (1000 psf).
7.	Surface Burning Characteristics with adhesive and sealer to be used	ASTM E84	Flame spread 25 or less smoke developed 50 or less
8.	Fungi Resistance	ASTM G21	Resistance to mold growth when inoculated with aspergillus niger (28 days for general application)

2.2 ADHESIVE:

A. Adhesive may be an integral part of the material or applied separately to surface receiving fireproofing material.

2.3 SEALER:

A. Surface burning characteristics as specified for fireproofing material.

B. Fungus resistant.

C. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.

E. VOC content: Product to comply with VOC content limits of authorities having jurisdiction and the following VOC limits when calculated according to 40 CFR 59, (EPA Method 24):
   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 150 g/L.
   3. Primers, Sealers, and Undercoaters: 200 g/L.

2.4 WATER:

A. Clean, fresh, and free from organic and mineral impurities.

B. pH of 6.9 to 7.1.

2.5 MECHANICAL BOND MATERIAL:

A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg per square meter (1.7 pounds per square yard) or as required, according to fire-resistance designs indicated and fire proofing manufacturer's written instructions.

B. Fasteners: ASTM C841.

C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.

D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachments.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.

B. Verify hangers, inserts and clips are installed before the application of fireproofing material.

C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.

D. Verify concrete work on steel decking and concrete encased steel is completed.

E. When applied in conjunction with roof structures or roof decks, verify that roofing, installation of rooftop HVAC equipment, and other related work are complete.

F. Verify temperature and enclosure conditions required by fire-proofing material manufacturer.

G. Conduct tests according to fireproofing manufacturer’s written instructions to verify that substrates are free of substances capable of interfering with bond. Submit test report.

3.2 APPLICATION:

A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.

B. Coordinate application of fireproofing material with other trades.

C. Cover other work and exterior openings subject to damage from fallout or overspray of fireproofing materials during application.

D. Application of Metal Lath:

1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
2. Apply to beam flanges 305 mm (12-inches) or more in width.
3. Apply to column flanges 406 mm (16-inches) or more in width.
4. Apply to beam or column web 406 mm (16-inches) or more in depth.
5. Tack weld or mechanically fasten on maximum of 305 mm (12-inch) center.
6. Lap and tie lath member in accordance with ASTM C841.

E. Mix and apply in accordance with manufacturer's instructions.

1. Mechanically control material and water ratios.
2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
4. Minimum ASTM E605 applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purlin or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms to be as follows:

a. Factory mixed cemitious material - 350 kg per cubic meter (22 lb. per cubic ft.).

b. Provide materials with higher density of 640 kg per cubic metric (40 lb. per cubic feet) in mechanical rooms and parking garages.

F. Complete application is to be completed in one area. Inspection and approval by COR is required before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS:

A. The applied fireproofing to be tested by a COR approved independent testing laboratory and paid for by the Contractor. Submit test reports documenting results of tests on the applied material in the project.

B. COR will select area to be tested in specific bays on each floor using a geometric grid pattern. Apply test sample every 929 square meters (10,000 square feet) of floor area or two (2) for each floor, whichever produces the greatest number of test areas.

C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test are not acceptable.

D. Areas showing less than required fireproofing characteristics are not suitable for the following field tests.

1. Test for cohesion/adhesion: ASTM E736.
2. Test for bond impact strength: ASTM E760.

3.4 PATCHING AND REPAIRING:

A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.

B. Perform corrective measures in accordance with fireproofing material manufacturer's recommendations.

1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
3. Do not hand mix material.

C. Repair:

1. Respray test and rejected areas.
2. Patch fireproofing material which is removed or disturbed after approval.

D. Perform final inspection of sprayed areas after patching and repair.

3.6 SCHEDULE:

A. Apply fireproofing material in interior structural steel members and on underside of interior steel floor and roof decks, except on following surfaces:

1. Structural steel and underside of steel decks in elevator or dumbwaiter machine rooms.
2. Steel members in elevator hoist ways.
3. Areas used as air handling plenums.
4. Steel to be encased in concrete or designated to receive other type of fireproofing.

Fire Rating Schedule

	Element	Hourly Rating	UL Design Reference
	Columns supporting one floor	2	
	Columns supporting more than one floor	2	
	Columns supporting roof	2	
	Floor decks	2	
	Floor supports	2	
	Roof decks	1	
	Roof supports	1	

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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. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES: Expansion and seismic joint firestopping.

C. Section 07 81 00, APPLIED FIREPROOFING: Spray applied fireproofing.

D. Section 07 92 00, JOINT SEALANTS: Sealants and application.

E. Section 23 31 00, HVAC DUCTS AND CASINGS: Fire and smoke damper assemblies in ductwork.

F. Section 23 37 00, AIR OUTLETS AND INLETS: Fire and smoke damper assemblies in ductwork.

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):

E84-23.....Surface Burning Characteristics of Building Materials

E699-16.....Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components

E814-23a.....Fire Tests of Penetration Firestop Systems

E2174-19.....Standard Practice for On-Site Inspection of Installed Firestop Systems

E2393-20.....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

E. Annual Issue Fire Resistance Directory

723-Edition 11(2018)....Standard for Test for Surface Burning Characteristics of Building Materials

1479-04(2015).....Fire Tests of Penetration Firestops

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

Annual Issue Certification Listings

G. Environmental Protection Agency (EPA):

40 CFR 59(2024).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 FIRESTOP SYSTEMS

A. Provide either factory built (Firestop Devices) or field erected (through-Penetration Firestop Systems) to form a specific building system maintaining 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 inches) nominal pipe or 0.01 square meter (16 square inches) in overall cross sectional area.

C. 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.
5. VOC Content: Firestopping sealants and sealant primers to comply with the following limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):
   a. Sealants: 250 g/L.
   b. Sealant Primers for Nonporous Substrates: 250 g/L.
   c. Sealant Primers for Porous Substrates: 775 g/L.

D. 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.

E. 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.

F. FM, UL, or WH rated or tested by an approved laboratory in accordance with ASTM E814.

G. 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.

H. 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 inches) 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.

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04-01-21

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 CONSTRUCTION REQUIREMENTS

D. Firestopping Penetrations: Section 07 84 00, FIRESTOPPING.

E. Glazing: Section 08 80 00, GLAZING.

G. Sound Rated Gypsum Partitions/Sound Sealants: Section 09 29 00, GYPSUM BOARD.

H. Mechanical Work: Section 22 05 11 COMMON WORK RESULTS FOR PLUMBING Section 23 05 10 Common Work Results for Boiler Plant and Steam Generation Section 23 05 11, COMMON WORK RESULTS FOR HVAC.

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.

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.

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(2021).....Elastomeric Cellular Preformed Gasket and Sealing Material

C612-14.....Mineral Fiber Block and Board Thermal Insulation

C717-17a.....Standard Terminology of Building Seals and Sealants

C734-15(R2019).....Test Method for Low-Temperature Flexibility of Latex Sealants after Artificial Weathering

C794-18.....Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants

C919-22.....Use of Sealants in Acoustical Applications.

C920-18.....Elastomeric Joint Sealants.

C1021-08(2023).....Laboratories Engaged in Testing of Building Sealants

C1193-16.....Standard Guide for Use of Joint Sealants.

C1248-22.....Test Method for Staining of Porous Substrate by Joint Sealants

C1330-23.....Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants

C1521-19.....Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints

D217-21a.....Test Methods for Cone Penetration of Lubricating Grease

D1056-20.....Specification for Flexible Cellular Materials—Sponge or Expanded Rubber

E84-23.....Surface Burning Characteristics of Building Materials

C. Sealant, Waterproofing and Restoration Institute (SWRI).

The Professionals' Guide

D. Environmental Protection Agency (EPA):

40 CFR 59(2024).....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCTS

2.1 SEALANTS:

A. Exterior Sealants:

1. S-1 Vertical surfaces, provide non-staining ASTM C920, Type S or M, Grade NS, Class 25, Use NT.
2. S-2 Horizontal surfaces, provide ASTM C920, Type S or M, 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. Stone to stone.
   e. Cast stone to cast stone.
   f. Masonry expansion and control joints.
   g. Wood to masonry.
   h. Masonry joints where shelf angles occur.
   i. Voids where items penetrate exterior walls.
   j. Metal reglets, where flashing is inserted into masonry joints, and where flashing is penetrated by coping dowels.

B. Floor Joint Sealant:

1. ASTM C920, Type S or M, Grade P, Class 25, Use T. S-3
2. S-3 Provide location(s) of floor joint sealant as follows.
   a. Seats of metal thresholds exterior doors.
   b. Control and expansion joints in floors, slabs, ceramic tile, and walkways.

C. Interior Sealants:

1. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system are to comply with the following

limits for VOC content when calculated according to 40 CFR 59, (EPA Method 24):

a. Architectural Sealants: 250 g/L.

b. Sealant Primers for Nonporous Substrates: 250 g/L.

c. Sealant Primers for Porous Substrates: 775 g/L.

2. S-4 Vertical and Horizontal Surfaces: ASTM C920, Type S or M, Grade NS, Class 25, Use NT.

4. Provide location(s) of interior sealant as follows:

a. Typical narrow joint 6 mm, (1/4 inch) or less at walls and adjacent components.

b. Perimeter of doors, windows, access panels which adjoin concrete or masonry surfaces.

c. Interior surfaces of exterior wall penetrations.

d. Joints at masonry walls and columns, piers, concrete walls or exterior walls.

e. Perimeter of lead faced control windows and plaster or gypsum wallboard walls.

f. Exposed isolation joints at top of full height walls.

g. Joints between bathtubs and ceramic tile; joints between shower receptors and ceramic tile; joints formed where nonplanar tile surfaces meet.

h. Joints formed between tile floors and tile base cove; joints between tile and dissimilar materials; joints occurring where substrates change.

i. Behind escutcheon plates at valve pipe penetrations and showerheads in showers.

D. Acoustical Sealant:

1. Conforming to ASTM C919; flame spread of 25 or less; and a smoke developed rating of 50 or less when tested in accordance with ASTM E84. Acoustical sealant have a consistency of 250 to 310 when tested in accordance with ASTM D217; remain flexible and adhesive after 500 hours of accelerated weathering as specified in ASTM C734; and be non-staining.

2. Provide location(s) of acoustical sealant as follows:

a. Exposed acoustical joint at sound rated partitions.

b. Concealed acoustic joints at sound rated partitions.

c. Joints where item pass-through sound rated partitions.

2.2 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.

2.3 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 FILLER:

A. Mineral fiberboard: ASTM C612, Class 1.

B. Thickness same as joint width.

C. Depth to fill void completely behind back-up rod.

2.6 PRIMER:

A. As recommended by manufacturer of caulking or sealant material.

B. Stain free type.

2.7 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.
   c. Unglazed surfaces of ceramic tile.
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.

C. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise. Take all necessary steps to prevent three-sided adhesion of sealants.

D. Interior Sealants: Where gypsum board partitions are of sound rated, fire rated, or smoke barrier construction, follow requirements of ASTM C919 only to seal all cut-outs and intersections with the adjoining construction unless specified otherwise.

1. Apply a 6 mm (1/4 inch) minimum bead of sealant each side of runners (tracks), including those used at partition intersections with dissimilar wall construction.
2. Coordinate with application of gypsum board to install sealant immediately prior to application of gypsum board.
3. Partition intersections: Seal edges of face layer of gypsum board abutting intersecting partitions, before taping and finishing or application of veneer plaster-joint reinforcing.
4. Openings: Apply a 6 mm (1/4 inch) bead of sealant around all cutouts to seal openings of electrical boxes, ducts, pipes and similar penetrations. To seal electrical boxes, seal sides and backs.
5. Control Joints: Before control joints are installed, apply sealant in back of control joint to reduce flanking path for sound through control joint.

3.6 FIELD QUALITY CONTROL:

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.

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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SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Prefabricated floor, wall, and ceiling seismic and building expansion joint assemblies.
   a. Metal plate covers at floor wall and ceiling joints.

1.2 RELATED WORK

A. Section 05 50 00, METAL FABRICATIONS: Steel Plate Expansion Joint Covers.

B. Section 07 60 00, FLASHING AND SHEET METAL: Sheet Metal Expansion Joint Seals.

C. Section 07 72 00, ROOF ACCESSORIES: Roof Expansion Joint Cover Assemblies.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this Section.

B. American Society of Civil Engineers (ASCE):

ASCE/SEI 7-10 - Minimum Design Loads For Buildings and Other Structures.

C. ASTM International (ASTM):

A36/A36M-22 - Structural Steel.

A240/A240M-22 - Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and for General Applications.

A283/A283M-22 - Low and Intermediate Tensile Strength Carbon Steel Plates.

A786/A786M-15 - Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates.

B36/B36M-20 - Brass, Plate, Sheet, Strip, and Rolled Bar.

B121/B121M-23 - Leaded Brass Plate, Sheet, Strip and Rolled Bar.

B209-21a - Aluminum and Aluminum-Alloy Sheet and Plate.

B209M-21a - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).

B221-21 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B221M-21 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

B455/B455M-20 - Copper-Zinc-Lead Alloy (Leaded-Brass) Extruded Shapes.

C864-05(2019) - Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.

D1187/D1187M-97(2018) - Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

E1399/E1399M-97(2022) - Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

E1966-15(2019) - Standard Test Method for Fire-Resistive Joint Systems.

D. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-06 - Metal Finishes Manual.

E. UL LLC (UL):
2079-15 - Standard for Tests for Fire Resistance of Building Joint Systems.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting minimum 30 days before beginning Work of this Section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Contractor.
   c. Installer.
   d. Other installers responsible for adjacent and intersecting work.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
   a. Installation schedule.
   b. Installation sequence.
   c. Preparatory work.
   d. Protection before, during, and after installation.
   e. Installation.
   f. Terminations.

g. Transitions and connections to other work.

h. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Include large-scale details indicating profiles of each type of expansion joint cover, splice joints between joint sections, transitions to other assemblies, terminations, anchorages, fasteners, and relationship to adjoining work and finishes.
2. Show size, configuration, and fabrication and installation details.
3. Include composite drawings showing work specified in other Sections coordinated with expansion joints.

C. Manufacturer's Literature and Data:

1. Description of each product specified.
2. Show movement capability of each cover assembly and suitability of material used in exterior seals for ultraviolet exposure.
3. Description of materials and finishes.
4. Installation instructions.

D. Samples: Submit 300 mm (12 inch) long samples.

1. Each type and color of metal finish for each required thickness and alloy.
2. Each type and color of flexible seal.

E. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Low Pollutant-Emitting Materials:

a. Identify volatile organic compound types and quantities.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Installer with project experience list.

G. Certificates: Indicate products comply with specifications.

1. Fire rated expansion joint cover assemblies.

H. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Regularly installs specified products.
   2. Installed specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.
B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting expansion joint cover assembly fabrication and installation. Show field measurements on Submittal Drawings.
   1. Coordinate field measurement and fabrication schedule to avoid delay.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Provide joint cover assemblies that permit unrestrained movement of joint without disengagement of cover, and, where applicable, maintain moisture, watertight and fire-rated protection.
B. Provide templates to related trades for location of support and anchorage items.

2.2 SYSTEM PERFORMANCE

A. Design expansion joint cover assemblies complying with specified performance.

B. Joint Movement: ASTM E1399.
   1. Nominal Joint Width: 1 inches).
   2. Minimum Movement Capability: 50 percent.
   3. Movement Type: Thermal and wind and seismic.

C. Floor Joints: Live loads, including rolling loads.
   1. Load Resistance: ASCE/SEI 7; Design criteria as indicated on Drawings.
   2. Maximum Deflection: 1/360 of span, maximum.

D. Fire Rated Joints: ASTM E1399, ASTM E1966, or UL 2079, including hose stream test at full-rated period.
   1. Fire rating: Match adjacent floor, wall, and ceiling construction.
   2. System: Capable of anticipated movement while maintaining fire rating.
   3. Coverless Applications: Maintain fire rating without joint cover system.

2.3 MATERIALS

A. Stainless Steel: ASTM A240/A240M, Type 302 or 304.

B. Structural Steel Shapes: ASTM A36/A36M.

C. Steel Plate: ASTM A283/A283M, Grade C.

D. Rolled Steel Floor Plate: ASTM A786/A786M.

E. Aluminum:
   1. Extruded: ASTM B221M (ASTM B221), alloy 6063-T5, 6063-T6, or 6061-T6.
   2. Plate and Sheet: ASTM B209M (ASTM B209), alloy 6061-T6.

F. Bronze: Manufacturer's standard alloy.
   1. Extruded: ASTM B455.
   2. Plate: ASTM B121.

G. Brass: ASTM B36/B36M.

H. Elastomeric Sealant: As specified in Section 07 92 00, JOINT SEALANTS.

I. Elastomeric Seals:

1. Flexible extruded polyvinyl chloride, meeting a Shore A hardness of 75 with UV stabilizer. Manufacturer's standard colors.

J. Thermoplastic Rubber:
   1. ASTM C864.
   2. Dense Neoprene or other material standard with expansion joint manufacturers having the same physical properties.

K. Compression Seals: Pre-compressed secondary sealant using preformed expanding foam sealant; open-cell polyurethane foam impregnated with polymer-modified acrylic adhesive.

L. Water Barrier Sheets: Neoprene or EPDM flexible sheet materials minimum 45 mils thick.
   1. Provide with drain tubes for horizontal applications.

M. Vinyl Invertor Sealant Waterstops: Manufacturer's standard shapes and grade.

N. Moisture Barrier: Fabric reinforced clear vinyl sheet material sized to accommodate opening.

O. Flexible Membrane: 1.5 mm (60 mil) EPDM sheet, with manufacturer's standard support foam.

P. Fire Barrier: Labeled by an approved independent testing laboratory for fire resistance rating indicated for maximum joint width.
   a. Thermal Insulation: Manufacturer's standard with factory cut miters and transitions.
   b. Fire Barrier Lengths:
      1) Joint widths up to and including 150 mm (6 inches): Maximum 15 m (50 feet) to minimize field splicing.
      2) Other Joint widths: 3 m (10 foot) with overlapping ends for field splicing.

Q. Ceramic Blanket: Manufacturer's standard joint filler to achieve fire rating indicated.

R. Butyl Caulk Tape: Self adhering double sided butyl rubber sealant tape with easy-release silicone coated paper.

2.4 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide each product from one manufacturer.

1. Provide ceiling and wall expansion joint cover assemblies design matching floor to wall and floor to floor expansion joint cover design.
2. Provide expansion joint cover assembly designs, profiles, materials and configuration indicated, as required to accommodate joint size variations in adjacent surfaces, and anticipated movement.

C. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.

3. Aluminum Recycled Content: 80 percent total recycled content, minimum.

4. Low Pollutant-Emitting Materials: Maximum VOC content by weight.
   a. Non-Flooring Adhesives and Sealants.

2.5 FABRICATION

A. Fabricate Expansion Joint Cover Assemblies:
   1. As complete assembly ready for installation.
   2. In longest practicable lengths to minimize number of end joints.
   3. With factory mitered corners where joint changes directions or abuts other materials.
      a. With closure materials and transition pieces, tee-joints, corners, curbs, cross-connections and other assemblies.

   4. Joints within enclosed spaces such as chase walls, include 1 mm (0.04 inch) thick galvanized steel cover where conventional expansion joint cover is not used.
   5. Where floor slab is fire rated provide ceramic blanket at joints.
   6. Seal Strip: Factory-formed and bonded to metal frames and anchor members.
   7. Compression Seals: Fabricate from expanding foam as secondary seal and elastomeric sealant to sizes and profiles shown.

B. Floor-to-Floor Metal Plate Joints:
   1. Frames: Metal, continuous on both sides of joint designed to support cover plate.
      a. Flush Design: Seating surface and raised floor rim to accommodate adjacent flooring.
      b. Anchorage: Concealed bolt and steel anchors for embedment in concrete.
   2. Cover Plate: Metal, matching frames where exposed.
      a. Supported Load: 19.2 MPa (400 psf), minimum.
      b. Rattle-free due to traffic.
   3. Fillers: Resilient material between raised rim of frame and edge of cover plate, where shown.
      a. No gaps or bulges over full design range joint movement.
   4. Fire Barrier: As required for fire resistance rating.
   5. Water Stop: Manufacturer's standard, continuous, full length of joint.
   6. Seismic: As required by Code.
   7. Finishes: As specified in drawings.

C. Floor-to-Wall Metal Plate Joints:
   1. Frames: Metal, continuous on floor side of joint only.
      a. Provide wall side frame where required by manufacturer's design.
   2. Cover Plates: Angle cover plates with countersunk flat-head exposed fasteners for securing cover plate to wall unless shown otherwise.
      a. Fastener Spacing: As recommended by manufacturer.
   3. Joint Design: Match adjacent floor to floor design.
   4. Fire Barrier: As required for fire resistance rating.
   5. Water Stop: Manufacturer's standard, continuous, full length of joint.
   6. Seismic: As required by Code.
   7. Finishes: As specified in drawings.

D. Interior Wall Joint Cover Assemblies:
   1. Frame: Metal, surface mounted, concealed fastening to wall on one sides of joint.
   2. Cover Plate: Metal, smooth surface, lap both sides of joint and permitting free movement on one side.

a. Fabricate with concealed attachment of cover to frame when cover is in close contact with adjacent wall surface finish.
b. Use angle cover plates at intersecting walls.

3. Joint Design: Match adjacent floor to floor design.
4. Fire Barrier: As required for fire resistance rating.
5. Seismic: As required by Code.
6. Finishes: As specified in drawings.

E. Extruded Thermoplastic Rubber Joint Assemblies:

1. Frames: Aluminum, both sides of joint.
2. Primary Seal: Flexible rubber on exposed face after frame installation with factory welded watertight miters and transitions.
   a. Anchor spaced at ends and not over 600 mm (24 inches).
      1) Variable movement extruded rubber primary seal designed to remain in aluminum frame, throughout movement of joint.
   b. Flush mounted seal minimum 3 mm (0.12 inch) thick with dual movement grooves designed for plus or minus 50 percent, movement of joint width.
   c. Seismic seal minimum 3 mm (0.12 inch) thick with multi-movement grooves designed for plus or minus 100 percent movement of joint width.
   d. Provide pantographic wind load supports, maximum 2400 mm (8 feet) on center to support seal systems of 300 mm (12 inches) wide and greater.
3. Secondary Seal: Continuous vinyl sheet seal.
4. Finishes: As specified in drawings.

F. Ceiling and Soffit Assemblies:

1. Frames: Metal, continuous on both sides of joint, flush mounted with no exposed fasteners.
2. Flexible Insert: Variable movement semi-rigid vinyl locked into frame.
   a. Face Style: Flush or accordion, as shown, to span joint width without sagging.
3. Seismic: As required by Code.
4. Finishes: As specified in drawings.

G. Preformed Sealant Joint: Factory installed elastomeric sealant between extruded aluminum angle frame both sides.
   1. Frames: Extruded aluminum angle on both sides of joint.
   2. Filler: Elastomeric sealant.
   3. Anticipated movement: 25 percent maximum.
   4. Finishes: As specified in drawings.

2.6 FINISHES

A. Carbon Steel: NAAMM AMP 500, Galvanized G90.
B. Stainless Steel: NAAMM AMP 500, No. 2B bright finish.
C. Aluminum Anodized Finish: NAAMM AMP 500.
   1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.

   2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
D. Aluminum Paint Finish:

   1. Fluorocarbon Finish: AAMA 2605; 70 percent fluoropolymer resin, 2-coat system.
   2. Fluorocarbon Finish: AAMA 605; 70 percent fluoropolymer resin, 2-coat system.
E. Bronze Finish: NAAMM-AMP 500, M32 mechanical finish, directional textured, natural medium satin.

2.7 ACCESSORIES

A. General: Manufacturer's standard anchors, fasteners, set screws, spaces, protective coating, and filler materials, adhesive and other accessories required for installation.

B. Barrier Coating: ASTM D1187/D1187M.
C. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.
D. Fasteners: Type and size recommended by expansion joint cover assembly manufacturer.
   1. Exterior Applications: Stainless steel.
   2. Fasteners for Aluminum: Stainless steel.

3. Other Applications: Galvanized steel or stainless steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Provide items embedded in concrete and masonry in time for building into work without delaying work.

B. Protect existing construction and completed work from damage.
C. Apply barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Install anchorage devices and fasteners for securing expansion joint assemblies to in-place construction where anchors are not embedded in concrete and masonry.
   1. Secure with metal fasteners, type and size to suit application.
C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.
D. Install joint cover assemblies aligned and positioned in correct relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.
   1. Allow for thermal expansion and contraction of metal to avoid buckling.
   2. Accommodate joint opening size at time of installation.
E. Set floor covers at elevations flush with adjacent finished flooring, unless shown otherwise.
F. Grout floor frames set in prepared recesses.
G. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Secure with required accessories.

H. Locate anchors at interval recommended by manufacturer, but minimum 75 mm (3 inches) from each end, and, maximum 600 mm (24 inches) on centers.

I. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.

J. Cut and fit ends to accommodate thermal expansion and contraction of metal to avoid buckling of frames and cover plates.

K. Flush Metal Cover Plates:

1. Secure flexible filler between frames to allow compression and expansion.
2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

L. Waterstops:

1. Install in conjunction with floor joints, and where shown.
2. Install continuously to prevent water damage to finish spaces.
3. Seal waterstop to frames to prevent water leakage.
4. Install drainage tubes from waterstops to discharge collected water in nearest plumbing air gap drain.

M. Fire Barriers:

1. Install in compliance with tested assembly.
2. Install at joints in floors and in fire rated walls.
3. Use fire barrier sealant furnished with expansion joint assembly.

N. Apply sealant where required to prevent water and air infiltration.

O. Vertical Exterior Extruded Thermoplastic Rubber.

1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with secondary seal.
2. Install primary seals retained in extruded aluminum side frames.

P. Extruded Thermoplastic Rubber or Seals:

1. For straight sections, install preformed seals in continuous lengths.
2. Vulcanize or heat-seal field spliced joints to provide watertight joints as recommended by manufacturer.

Q. Preformed Elastomeric Sealant Joint:

1. Locate joint directly over joints in wall and floor substrates.

2. Fasten full length to substrate using construction adhesive.
3. Install flush or slightly below finish material.

3.3 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed metal surfaces. Remove contaminants and stains.

3.4 PROTECTION

A. Cover floor joints with plywood where wheel traffic occurs before Substantial completion.

B. Remove protective covering when adjacent work areas are completed. Clean exposed surfaces in compliance with manufacture's printed instructions.

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DIVISION 08
OPENINGS

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hollow metal doors hung in hollow metal frames at interior locations.
2. Hollow metal door frames for wood doors at interior locations.
3. Glazed openings and louvers in hollow metal doors.

1.2 RELATED WORK

A. Section 05 50 00, METAL FABRICATIONS: Frames fabricated of structural steel.

B. Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS: Aluminum frames entrance work.

C. Section 08 71 00, DOOR HARDWARE: Door Hardware:

D. Section 08 80 00, GLAZING: Glazing.

E. Card Readers and Biometric Devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEM.

F. Security Monitors: Section 28 23 00, VIDEO SURVEILLANCE.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standard Institute (ANSI):

A250.8-2023.....Standard Steel Doors and Frames

C. ASTM International (ASTM):

A240/A240M-23.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-23.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip

A1008/A1008M-23.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability, Solution Hardened, and Bake Hardenable

B209-21a.....Aluminum and Aluminum-Alloy Sheet and Plate
B209M-21a.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)
B221-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
B221M-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
D3656/D3656M-13(2021)...Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns
E90-23.....Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

D. Federal Specifications (Fed. Spec.):
L-S-125B.....Screening, Insect, Nonmetallic

E. Master Painters Institute (MPI):
No. 18.....Primer, Zinc Rich, Organic

F. National Association of Architectural Metal Manufacturers (NAAMM):
AMP 500-21.....Metal Finishes Manual

G. National Fire Protection Association (NFPA):
80-22.....Fire Doors and Other Opening Protectives

H. UL LLC (UL):
10C-20.....Positive Pressure Fire Tests of Door Assemblies
1784-17.....Air Leakage Tests of Door Assemblies and Other Opening Protectives

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:
1. Description of each product.
2. Include schedule showing each door and frame requirements fire label and smoke control label for openings.
3. Installation instructions.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Test reports: Certify products complywith specifications.

1. Sound rated door.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer with project experience list.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
   a. Project Experience List: Provide contact names and addresses for completed projects.

1.6 DELIVERY

A. Fasten temporary steel spreaders across the bottom of each door frame before shipment.

B. Deliver products in manufacturer's original sealed packaging.

C. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

D. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Design hollow metal doors and frames complying with specified performance:

1. Fire Doors and Frames: UL 10C; NFPA 80 labeled.
   a. Fire Ratings: See drawings.

2. Smoke Control Doors and Frames: UL 1784; NFPA 80 labeled, maximum 0.15424 cubic meter/second/square meter (3.0 cubic feet/minute/square foot) at 24.9 Pa (0.10 inches water gauge) pressure differential.
3. Sound Rated Doors and Frames: Minimum 45 sound transmission class (STC) when tested according to ASTM E90.

2.2 MATERIALS

A. Stainless Steel: ASTM A240/A240M; Type 304.
B. Sheet Steel: ASTM A1008/A1008M, cold-rolled.

C. Galvanized Sheet Steel: ASTM A653.
D. Insect Screening: ASTM D3656/D3656M, 18 by 18 aluminum wire mesh.
E. Aluminum Sheet: ASTM B209M (ASTM B209).
F. Aluminum Extrusions: ASTM B221M (ASTM B221).

2.3 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings .
B. Provide hollow metal doors and frames from one manufacturer.
C. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Stainless Steel Recycled Content: 70 percent total recycled content, minimum.

3. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.4 HOLLOW METAL DOORS

A. Hollow Metal Doors: ANSI A250.8; 44 mm (1-3/4 inches) thick. See drawings for sizes and designs.

1. Interior Doors: Level 1 and Physical Performance Level C, standard duty; Model 2, seamless

B. Door Faces:

1. Interior Doors: Sheet steel Z120 or ZF120 (G40 or A40 coating.

C. Door Cores:

1. Interior Doors: vertical steel stiffeners .
2. Fire Doors: Manufacturer's standard complying with specified fire rating performance.

2.5 HOLLOW METAL FRAMES

A. Hollow Metal Frames: ANSI A250.8; face welded . See drawings for sizes and designs.

1. Interior Frames:
   a. Level 1 Hollow Metal Doors: 1.0 mm (0.042 inch) thick.
   b. Level 1 Hollow Metal Doors: 1.0 mm (0.042 inch) thick.
   c. Wood Doors: 0.042 inch thick.

   d. Interior Automatic Operator Door Frames: 1.7 mm (0.067 inch) thick.

B. Frame Materials:

1. Interior Frames: Sheet steel Z120 or ZF120 (G40 or A40) coating .

2.6 LOUVERS

A. Louver Style: Sight-proof permitting free ventilation.

1. Provide insect screen and wire guards at exterior doors.

B. Louver Construction: Sheet metal matching door faces.

1. Interior Door Louvers: 0.8 mm (0.032 inch) thick.

2.7 FABRICATION

A. Hardware Preparation: ANSI A250.8; for hardware specified in Section 08 71 00, DOOR HARDWARE.

B. Hollow Metal Door Fabrication:

1. Close top edge of exterior doors flush and seal to prevent water intrusion.

2. Fill spaces between vertical steel stiffeners with insulation.

C. Fire and Smoke Control Doors:
   1. Close top and vertical edges flush.
   2. Apply steel astragal to active leaf at pair and double egress doors.
      a. Exception: Where vertical rod exit devices are specified for both leaves swinging in same direction.
   3. Fire and Smoke Control Door Clearances: NFPA 80.

D. Sound Rated Doors:
   1. Seals: Integral spring type automatic door bottom seal.
   2. Fabricate vision panel cutouts and frames to receive double glazing as shown on drawings.

E. Hollow Metal Frame Fabrication:
   1. Fasten mortar guards to back of hardware reinforcements, except on lead-lined frames.

   2. Terminated Stops: ANSI A250.8.

   3. Two Piece Frames:
      a. One piece unequal leg finished rough buck sub-frames as shown, drilled for anchor bolts.
      b. Unequal leg finished frames formed to fit subframes and secured to subframe legs with countersunk, flat head screws, spaced 300 mm (12 inches) on center at head and jambs on both sides.
      c. Preassemble at factory for alignment.
   4. Frame Anchors:
      a. Floor anchors:
         1) Provide extension type floor anchors to compensate for depth of floor fills.
         2) Provide 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive floor fasteners.
         3) Provide 50 mm by 50 mm by 9 mm (2 inch by 2 inch by 3/8 inch) clip angle for lead lined frames, drilled for floor fasteners.
         4) Provide mullion 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two floor fasteners and frame anchor screws.

5) Provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for floor fasteners and frame anchor screws for sill sections.
   a) Space floor bolts50 mm (24 inches) on center.

b. Jamb anchors:
   1) Place anchors on jambs:
      a) Near top and bottom of each frame.
      b) At intermediate points at maximum 600 mm (24 inches) spacing.
   2) Form jamb anchors from steel minimum 1 mm (0.042 inch) thick.
   3) Anchors set in masonry: Provide adjustable anchors designed for friction fit against frame and extended into masonry minimum 250 mm (10 inches). Provide one of following types:
      a) Wire Loop Type: 5 mm (3/16 inch) diameter wire.
      b) T-Shape type.
      c) Strap and stirrup type: Corrugated or perforated sheet steel.
   4) Anchors for stud partitions: Provide tabs for securing anchor to sides of studs. Provide one of the following:
      a) Welded type.
      b) Lock-in snap-in type.
   5) Anchors for frames set in prepared openings:
      a) Steel pipe spacers 6 mm (1/4 inch) inside diameter, welded to plate reinforcing at jamb stops, or hat shaped formed strap spacers 50 mm (2 inches) wide, welded to jamb near stop.
      b) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass through frame and spacers.
      c) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
   6) Anchors for observation windows and other continuous frames set in stud partitions.
      a) Weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.
      b) Space maximum 600 mm (24 inches) on centers.

7) Modify frame anchors to fit special frame and wall construction.
8) Provide special anchors where shown on drawings and where required to suit application.

F. Sound Rated Door Frames:
1. Seals: Integral continuous gaskets on frames.

G. Louver Fabrication:
1. Fabricate louvers as complete units.
2. Weld stationary blades to frames.
3. Factory install louvers in door cutouts, welded to door.

2.8 FINISHES

A. Steel: ANSI A250.8; shop primed.

B. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.
1. Blend welds to match adjacent finish.

C. Finish exposed surfaces after fabrication.

D. Aluminum Anodized Finish: NAAMM AMP 500.
1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.
3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

2.9 ACCESSORIES

A. Primers: ANSI A250.8.

B. Barrier Coating: ASTM D1187/D1187M.

C. Welding Materials: AWS D1.1/D1.1M, type to suit application.

D. Clips Connecting Members and Sleeves: Match door faces.

E. Fasteners: Galvanized steel.
1. Metal Framing: Steel drill screws.
2. Masonry and Concrete: Expansion bolts and power actuated drive pins.

F. Anchors: Galvanized steel.

G. Galvanizing Repair Paint: MPI No. 18.

H. Insulation: Unfaced mineral wool.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Apply barrier coating to metal surfaces in contact with cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
2. Install fire doors and frames according to NFPA 80.
3. Install smoke control doors and frames according to NFPA 105.

3.3 FRAME INSTALLATION

A. Apply barrier coating to concealed surfaces of frames built into masonry.

B. Plumb, align, and brace frames until permanent anchors are set.

1. Use triangular bracing near each corner on both sides of frames with temporary wood spreaders at midpoint.
2. Use wood spreaders at bottom of frame when shipping spreader is removed.
3. Where construction permits concealment, leave shipping spreaders in place after installation, otherwise remove spreaders when frames are set and anchored.
4. Remove wood spreaders and braces when walls are built and jamb anchors are secured.

C. Floor Anchors:

1. Anchor frame jambs to floor with two expansion bolts.
   a. Lead Lined Frames: Use 9 mm (3/8 inch) diameter bolts.
   b. Other Frames: Use 6 mm (1/4 inch) diameter bolts.
2. Power actuated drive pins are acceptable to secure frame anchors to concrete floors.

D. Jamb Anchors:
   1. Masonry Walls:
      a. Embed anchors in mortar.
      b. Fill space between frame and masonry with grout or mortar as walls are built.
   2. Metal Framed Walls: Secure anchors to sides of studs with two fasteners through anchor tabs.
   3. Prepared Masonry and Concrete Openings:
      a. Direct Securement: 6 mm (1/4 inch) diameter expansion bolts through spacers.
      b. Subframe or Rough Buck Securement:
         1) 6 mm (1/4 inch) diameter expansion bolts on 600 mm (24 inch) centers.
         2) Power activated drive pins on 600 mm (24 inches) centers.
      c. Secure two-piece frames to subframe or rough buck with machine screws on both faces.

E. Frames for Sound Rated Doors: Fill frames with insulation.

F. Lead Lined Frames:
   1. Extend jambs and anchor with clip angles to structure above.
      a. Fasteners to Concrete: Minimum two, 9 mm (3/8 inch) diameter expansion bolts or power actuated drive pins.
      b. Connection to Structural Steel: Welded.

G. Touch up damaged factory finishes.
   1. Repair galvanized surfaces with galvanized repair paint.
   2. Repair painted surfaces with touch up primer.

3.4 DOOR INSTALLATION

A. Install doors plumb and level.

B. Adjust doors for smooth operation.

C. Touch up damaged factory finishes.
   1. Repair galvanized surfaces with galvanized repair paint.
   2. Repair painted surfaces with touch up primer.

3.5 CLEANING

A. Clean exposed door and frame surfaces. Remove contaminants and stains.

3.6 PROTECTION

A. Protect doors and frames from traffic and construction operations.

B. Remove protective materials immediately before acceptance.

C. Repair damage.

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SECTION 08 14 00
INTERIOR WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior flush wood doors transparent finish.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Paints and Coatings and Composite Wood and Agrifiber VOC Limits.

B. Section 08 71 00, DOOR HARDWARE: Door Hardware including hardware location (height).

C. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES: Installation of Doors.

D. Section 08 71 00, DOOR HARDWARE: Installation of Door Hardware.

E. Door Finish-as shown on drawings.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American National Standards Institute/Window and Door Manufacturers Association (ANSI/WDMA):

1. I.S. 1A-13 - Architectural Wood Flush Doors.
2. I.S. 6A-13 - Interior Architectural Stile and Rails Doors.

C. ASTM International (ASTM):

1. E90-23 - Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. National Fire Protection Association (NFPA):

1. 80-22 - Fire Doors and Other Opening Protectives.
2. 252-22 - Fire Tests of Door Assemblies.

E. UL LLC (UL):

1. 10C-20 - Positive Pressure Fire Tests of Door Assemblies.

F. Window and Door Manufacturers Association (WDMA):

1. TM 7-23 - Cycle-Slam Test.
2. TM 8-23 - Hinge Loading Test.
3. TM 10-23 - Screw Holding Capacity.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.
2. Include details of glazing louvers .
3. Indicate project specific requirements not included in Manufacturer's Literature and Data submittal.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Fire rated doors showing conformance with NFPA 80.

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D. Samples:

1. Corner section of flush veneered door 300 mm (12 inches) square, showing details of construction, labeled to show grade and type number and conformance to specified standard.
2. Veneer sample 200 mm by 275 mm (8 inch by 11 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.

E. Sustainable Construction Submittals:

1. Low Pollutant-Emitting Materials:
   Show volatile organic compound types and quantities.

F. Test Reports: Indicate products complywith specifications.

1. Screw Holding Capacity Test.
2. Cycle-Slam Test.
3. Hinge-Loading Test.

G. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly and presently manufactures specified products.
2. Manufactures specified products with satisfactory service on five similar installations for minimum five years.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.
   1. Minimum 0.15 mm (6 mil) polyethylene bags or cardboard packaging to remain unbroken during delivery and storage.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, and manufacture date.
   1. Identify door opening corresponding to Door Schedule.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging. Retain packaging for door protection after installation.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.
   1. Store doors according to ANSI/WDMA I.S. 1A.
B. Protect products from damage during handling and construction operations.

1.8 FIELD CONDITIONS

A. Environment:
   1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
   2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
   3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

   Comply with door manufacturer's instructions for relative humidity.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant interior factory finished flush wood doors against material and manufacturing defects.

   1. Warranty Period: Lifetime of original installation.

PART 2 - PRODUCTS

2.1 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.
B. Provide each product from one manufacturer.

C. Sustainable Construction Requirements:

1. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
2. Paints and coatings.
3. Composite wood and agrifiber.

2.2 FLUSH WOOD DOORS

A. General:

1. ANSI/WDMA I.S. 1A, Extra Heavy Duty.
2. Adhesive: Type II.
3. Core: Structural composite lumber, except when mineral core is required for fire rating.
4. Thickness: 1-3/4 inches unless otherwise shown or specified.

B. Faces:

1. ANSI/WDMA I.S. 1A.
2. One species throughout project unless scheduled or otherwise shown.
3. Match face veneers for doors for uniform effect of color and grain at joints.
4. Door Edges: Same species as door face veneer, except maple is acceptable for stile face veneer on birch doors.
5. In existing buildings, where doors are required to have transparent finish, use wood species, grade, and assembly of face veneers to match adjacent existing doors.
6. Painted Finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay.
7. Factory sand doors for finishing.

C. Wood For Stops, Louvers, Muntins and Moldings For Flush Doors Required to Have Transparent Finish:

1. Solid wood of same species as face veneer, except maple is acceptable on birch doors.
2. Glazing:
   a. On non-fire-rated doors, use applied wood stops nailed tightly on room side and attached on opposite side with flathead,

countersunk wood screws, spaced approximately 125 mm (5 inches) on center.

D. Fire-Rated Wood Doors:
   1. Fire Resistance Rating:
      a. B Label: 1-1/2 hours.
      b. C Label: 3/4 hour.
   2. Provide 20-minute smoke-rated doors in smoke-rated barriers.
   3. Labels:
      a. Comply with NFPA 252, UL 10C, and labeled by qualified testing and inspection agency showing fire resistance rating.
         1) Metal labels with raised or incised markings.
   4. Performance Criteria for Stiles of Doors Utilizing Standard Mortise Leaf Hinges:
      a. Hinge Loading: WDMA TM 8. Average of 10 test samples for Extra Heavy Duty doors.
      b. Direct Screw Withdrawal: WDMA TM 10 for Extra Heavy Duty doors. Average of 10 test samples using a steel, fully threaded #12 wood screw.
      c. Cycle-Slam: 1,000,000 cycles with no loose hinge screws or other visible signs of failure when tested according to WDMA TM 7.
   5. Hardware Reinforcement:
      a. Provide fire smoke rated doors with hardware reinforcement blocking.
      b. Size of lock blocks as required to secure hardware specified.
      c. Top, Bottom and Intermediate Rail Blocks: Minimum 125 mm (5 inches) by full core width.
      d. Reinforcement blocking in compliance with labeling requirements. Mineral material similar to core is not acceptable.
   6. Other Core Components: Manufacturer's standard as allowed by labeling requirements.
   7. Glazed Vision Panel Frame: Steel approved for use in labeled doors.
   8. Astragal: Steel type for pairs of doors.

E. Smoke Barrier Doors:
   1. Glazed Vision Panel Frame: Steel approved for use in labeled doors.

2. Astragal: Steel type for pairs of doors, including double egress doors.

F. Sound Rated Doors:
   1. Fabricated as specified for flush wood doors with additional construction requirements to comply with specified sound transmission class (STC).
   2. STC Rating of door assembly in place when tested according to ASTM E90 by independent acoustical testing laboratory minimum 35.
      a. Accessories:
         1) Frame Gaskets and Automatic Door Bottom Seal: As specified in Section 08 71 00, DOOR HARDWARE.

2.3 STILE AND RAIL WOOD DOORS

2.4 FABRICATION

A. Factory machine interior wood doors to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
   1. Factory fit fire rated doors according to NFPA 80.
B. Rout doors for hardware using templates and location heights specified in Section 08 71 00, DOOR HARDWARE.
C. Factory fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness undercut where shown.
D. Clearances between Doors and Frames and Floors:
   1. Fire Rated Doors: Comply with NFPA 80.
      a. Doors with Automatic Bottom Seal: Maximum clearance 10 mm (3/8 inch) at threshold.
      b. Other Door Bottoms: Maximum 3 mm (1/8 inch) clearance at the jambs, heads, and meeting stiles, and a 19 mm (3/4 inch) clearance at bottom, except as otherwise specified.
   2. Door Jambs, Heads, and Meeting Stiles: Maximum 3 mm (1/8 inch).
E. Provide cutouts for glazed and louver openings.
F. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.
G. Identify each door on top edge.
   1. Mark with stamp, brand or other indelible mark, giving manufacturer’s name, door’s trade name, construction of door, date of manufacture and quality.

2. Mark door or provide separate certification including name of inspection organization.
3. Identify door manufacturing standard, including glue type.
4. Identify veneer and quality certification.
5. Identification of preservative treatment for stile and rail doors.

2.5 FINISHES

A. Field Finished Doors: Seal top and bottom edges of doors with two coats of catalyzed polyurethane or water resistant sealer.

B. Factory Transparent Finish:

1. Factory finish flush wood doors.
   a. ANSI/WDMA I.S. 1A Section F-3 Finish System Descriptions for System 5, Conversion Varnish or System 7, Catalyzed Vinyl.
   b. Use stain when required to produce finish specified in drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Verify door frames are properly anchored.
2. Verify door frames are plumb, square, in plane, and within tolerances for door installation.

B. Protect existing construction and completed work from damage.

C. Install astragal on active leaf of pair of smoke doors and one leaf of double egress smoke doors.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. Install fire rated doors according to NFPA 80.
2. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 PROTECTION

A. After installation, place shipping container over door and tape in place.

1. Do not apply tape to door faces and edges.

B. Provide protective covering over exposed hardware in addition to covering door.

C. Maintain covering in good condition until removal is directed by Contracting Officer's Representative.

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04-01-22

ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and panels installed in walls and ceilings.

1.2 RELATED WORK

A. Section 05 50 00, METAL FABRICATIONS: Wire Mesh and Screen Access Doors.

B. Section 08 71 00, DOOR HARDWARE: Lock Cylinders.

C. Section 09 91 00, PAINTING: Field Painting.

D. Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS: Access Doors for Control or Drain Valves.

E. Section 22 40 00, PLUMBING FIXTURES: Access Doors for Plumbing Valves.

F. Section 23 31 00, HVAC DUCTS AND CASINGS: Locations of Access Doors for Ductwork Cleanouts.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Welding Society (AWS):

D1.3/D1.3M-2022.....Structural Welding Code - Sheet Steel (6th Edition.

C. ASTM International (ASTM):

A653/A653M-22.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Sip Process.

A1008/A1008M-22.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

A666-23.....Annealed or Cold-Worked Austenitic Stainless Steel sheet, Strip, Plate, and Flat Bar.

E119-23.....Fire Test of Building Construction and Materials.

D. National Fire Protection Association (NFPA):

80-2022 Edition.....Fire Doors and Other Opening Protectives.

252-2022 Edition.....Fire Tests of Door Assemblies.

E. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual.

F. UL LLC (UL):

Listed.....Online Certifications Directory.

10B-09 (Edition 15).....Standard for Fire Tests of Door Assemblies.

263-21 (Edition 15).....Fire Tests of Building Construction and Materials.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify field conditions affecting access door fabrication and installation. Show field measurements on Submittal Drawings.

1. Coordinate field measurement and fabrication schedule to avoid delay.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A1008/A1008M.

B. Galvanized Steel: ASTM A653/A653M.

C. Stainless Steel: ASTM A666; Type 302 or Type 304.

2.2 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide each product from one manufacturer.

C. Sustainable Construction Requirements:

1. Steel Access Doors Recycled Content: 30 percent total recycled content, minimum.

2. Stainless Steel Access Doors Recycled Content: 70 percent total recycled content, minimum.

2.3 ACCESS DOORS, FIRE-RATED

2.4 ACCESS DOORS, FLUSH PANEL, NON-RATED

A. Door Panel:

1. 0.07 inch thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. 1.5 mm (0.06 inch) thick steel sheet, depth and configuration to suit material and construction type where installed.
2. Frame Flange: Provide at units installed in concrete, masonry, and gypsum board.
3. Exposed Joints in Flange: Weld and grind smooth.

C. Hinge:

1. Concealed spring hinge, 175 degrees of opening.
2. Removable hinge pin to allow removal of door panel from frame.

D. Lock:

1. Flush, screwdriver-operated cam lock.

2.5 ACCESS DOOR, RECESSED PANEL, NON-RATED

2.6 FABRICATION - GENERAL

A. Size: Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.

B. Component Fabrication: Straight, square, flat and in same plane where required.

1. Exposed Edges: Slightly rounded, without burrs, snags and sharp edges.
2. Exposed Welds: Continuous, ground smooth.
3. Welding: AWS D1.3/D1.3M.

C. Locks and Non-Continuous Hinges: Provide in numbers required to maintain alignment of door panel with frame.

D. Anchoring: Make provisions in frame for anchoring to adjacent construction. Provide anchors in size, number and location on four sides to secure access door to substrate.

2.7 FINISHES

A. Steel Paint Finish:

1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
   a. One coat primer.
   b. One coat thermosetting topcoat.
   c. Dry-film Thickness: 0.05 mm (2 mils) minimum.
   d. Color: Refer to drawings.

B. Stainless Steel Exposed Surfaces: NAAMM AMP 500; No.06 Metal Finishes.

2.8 ACCESSORIES

A. Fasteners: Type and size recommended by access door manufacturer, to suit application.

1. Stainless Steel Access Doors: Stainless steel fasteners.
2. Other Access Doors: Galvanized steel fasteners.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Verify access door locations and sizes provide required maintenance access to installed building services components.

B. Protect existing construction and completed work from damage.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Install access doors and panels permitting access to service valves, traps, dampers, cleanouts, and other mechanical, electrical and conveyor control items concealed in walls and partitions, and concealed above gypsum board and plaster ceilings.
C. Install fire rated access door according to NFPA 80.
D. Install fire-rated doors in fire-rated partitions and ceilings.
E. Install flush access panels in partitions and in gypsum board and plaster ceilings.

3.3 ACCESS DOOR AND FRAME INSTALLATION

A. Wall Installations: Install access doors in openings with sides vertical.
B. Ceiling Installations: Install access doors parallel to ceiling suspension grid or room partitions.
C. Frames without Flanges: Install frame flush with surrounding finish surfaces.
D. Frames with Flanges: Overlap opening, with face uniformly spaced from finish surface.
E. Recessed Panel Access Doors: Install with face of surrounding materials flush with door panel installed finish.
F. Secure frames to adjacent construction with fasteners.
G. Install type, size and quantity of anchoring device suitable for material surrounding opening to maintain alignment, and resist displacement, during normal use of access door.
H. Field Painting Primed Access Doors: Comply with the requirements of Section 09 91 00, PAINTING.

3.4 ADJUSTMENT

A. Adjust hardware so door panel opens freely.
B. Adjust door when closed so door panel is centered in frame.

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SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Aluminum-framed entrances.

1.2 RELATED REQUIREMENTS

A. Door Finish and Color: as shown on drawings.

B. Glass and Glazing: Section 08 80 00, GLAZING.

C. Hardware: Section 08 71 00, DOOR HARDWARE.

D. Aluminum Finish and Color: as shown on drawings.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Architectural Manufacturers Associations (AAMA):

2603-22.....Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels

2604-22.....Performance Requirements and Test Procedures or High Performance Organic Coatings on Architectural Extrusions and Panels

2605-22.....Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels

C. American Welding Society (AWS):

D1.2/D1.2M-20.....Structural Welding Code - Aluminum

D. ASTM International (ASTM):

A240/A240M-23.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

B209-23.....Aluminum and Aluminum-Alloy Sheet and Plate.

B209M-23.....Aluminum and Aluminum-Alloy Sheet and Plate (Metric)

B221-23.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

B221M-23.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

D1187/D1187M-97(2018)...Asphalt-Base Emulsions for Use as Protective Coatings for Metal

E283/E283M-22.....Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen

E330/E330M-22.....Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

E331-22.....Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference

E1886-21.....Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missiles and Exposes to Cyclic Pressure Differentials

E1996-22.....Performance of Exterior Windows, Curtain Walls, Doors, and impact Protective Systems Impacted by Windborne Debris in Hurricanes

F468-23.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use

F593-23.....Stainless Steel Bolts, Hex Cap Screws, and Studs

E. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

F. National Fenestration Rating Council (NFRC):

500-21.....Determining Fenestration Product Condensation Resistance Values

G. Department of Veterans Affairs(VA):

1. VA Physical Security and Resiliency Design Manual October 1, 2020

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.

1. Required Participants:

a. Contracting Officer's Representative.

b. Architect/Engineer.

c. Contractor.

d. Installer.

e. Manufacturer's field representative.

f. Other installers responsible for adjacent and intersecting work.

2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.

a. Installation schedule.

b. Installation sequence.

c. Preparatory work.

d. Protection before, during, and after installation.

e. Installation.

f. Terminations.

g. Transitions and connections to other work.

h. Other items affecting successful completion.

3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings: Minimum 1 to 2 (half size) scale.

1. Show size, configuration, and fabrication and installation details.
2. Show anchorage and reinforcement.
3. Show interface and relationship to adjacent work, including thermal, air, and water barrier continuity.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Doors, each type.
3. Entrance and Storefront construction.
4. Installation instructions.
5. Warranty.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Test reports: Certify each product complies with specifications.

F. Certificates: Certify each product complies with specifications.
   1. Certify anodized finish thickness.
G. Qualifications: Substantiate qualifications comply with specifications.
   1. Manufacturer with project experience list.
   2. Installer with project experience list.
   3. Welders and welding procedures.
H. Delegated Design Drawings and Calculations: Signed and sealed by responsible design professional.
   1. Show location and magnitude of loads applied to building structural frame.
   2. Identify deviations from details shown on drawings.
I. Operation and Maintenance Data:
   1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Regularly manufactures specified products.
   2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.
B. Installer Qualifications: Manufacturer authorized representative.
   1. Regularly installs specified products.
   2. Installed specified products with satisfactory service on five similar installations for minimum five years.
      a. Project Experience List: Provide contact names and addresses for completed projects.
C. Welders and Welding Procedures Qualifications: AWS D1.2/D1.2M.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original sealed packaging.
B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.
C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.
D. Store products indoors in dry, weathertight conditioned facility.
E. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant painted finish against material and manufacturing defects.

1. Warranty Period: 20 years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Delegated Design: Prepare submittal documents including design calculations and drawings signed and sealed by registered design professional, licensed in state where work is located.
1. Minor deviations to details shown on drawings to accommodate manufacturer’s standard products may be accepted by Contracting Officer's Representative when deviations do not affect design concept and specified performance.

B. Design aluminum framed entrances and storefronts complying with specified performance:

1. Condensation Resistance: NFRC 500.
   a. Fixed Framing: 45 CRF, minimum.
2. Water Resistance: ASTM E331; No uncontrolled penetration at380 Pa (8 pounds/square foot), minimum, pressure differential.
3. Fixed Framing Air Infiltration Resistance: ASTM E283; 0.30 liter/second/square meter (0.06 cubic foot/minute/square foot), maximum at 300 Pa (6.24 pounds/square foot), minimum, pressure differential.
4. Entrance Doors Air Infiltration Resistance: ASTM E283; maximum allowable at 75 Pa (1.57 pounds/square foot), minimum, pressure differential.
   a. Single Doors: 2.5 liter/second/square meter (0.5 cubic foot/minute/square foot).
   b. Paired Doors: 6 liter/second/square meter (1.2 cubic foot/minute/square foot).

2.2 MATERIALS

A. Aluminum:

1. Sheet Metal: ASTM B209M (ASTM B209), minimum 1.6 mm (0.063 inch) thick.
2. Extrusions: ASTM B221M (ASTM B221).
   a. Framing: Minimum 3 mm (0.125 inch) wall thickness.
   b. Glazing Beads, Moldings, and Trim: Minimum 1.25 mm (0.050 inch) thick.
3. Alloy 6063 temper T5 for doors, door frames, and transoms.
4. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
   a. Color Anodized Aluminum: Provide aluminum alloy required to produce specified color.

B. Stainless Steel: ASTM A240/A240M; Type 302 or Type 304.

2.3 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide aluminum framed entrances and storefronts from one manufacturer and from one production run .

C. Provide aluminum entrances, systems from same manufacturer.

D. Sustainable Construction Requirements:

1. Aluminum Recycled Content: 50 percent total recycled content, minimum.

2.4 FRAMES

A. Framing Members: Extruded aluminum, thermally broken .

B. Stops: Provide integral fixed stops and glass rebates and snap-on removable stops.

C. Provide concealed screws, bolts and other fasteners.

D. Secure cover boxes to frames in back of lock strike cutouts.

2.5 STILE AND RAIL DOORS

A. Stiles and Rails: Extruded aluminum, thermally broken.

1. Thickness: 45 mm (1-3/4 inch).
2. Stiles and Head Rails: 90 mm (3-1/2 inches) wide.
3. Bottom Rails: 250 mm (10 inches) wide.

B. Single-Acting Doors:

1. Bevel: 3 mm (1/8 inch) at lock, hinge, and meeting stile edges.
2. Clearances: 2 mm (1/16 inch) at hinge stiles, 3 mm (1/8 inch) at lock stiles and top rails, and 5 mm (3/16 inch) at floors and thresholds.

C. Glass Rebates: Integral with stiles and rails.

D. Glazing Beads: Extruded aluminum, 1.3 mm (0.050 inch) thick. Integral with stiles and rails or applied type, snap-fit secured.

E. Stile and Rail Joints: Welded or interlocking dovetail joints between stiles and rails.

1. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel tie rod extending into stiles, and having self-locking nut and washer at both ends.
2. Reinforce stiles and rails to prevent door distortion when tie rods are tightened.
3. Provide compensating spring-type washer under each nut for stress relief.
4. Construct joints to remain rigid and tight when door is operated.

2.6 FLUSH PANEL DOORS

2.7 COLUMN COVERS AND TRIM

2.8 FABRICATION

A. Form metal parts and fit and assemble joints, except joints designed to accommodate movement. Seal joints to resist air infiltration and water penetration.

B. Welding:

1. Make welds without distorting and discoloring exposed surfaces.
2. Clean and dress welds. Remove welding flux and weld spatter.

C. Prepare and reinforce doors and frames for hardware and accessories.

1. Coordinate preparation with specified hardware. See Section 08 71 00, DOOR HARDWARE.
2. Fabricate reinforcement from stainless steel plates.
   a. Hinge and pivot reinforcing: Minimum 4.5 mm (0.179 inch) thick.
   b. Lock Face, Flush Bolts, Concealed Holders, Concealed and Surface Mounted Closers Reinforcing: Minimum 2.6 mm (0.104 inch) thick.
   c. Other Surface Mounted Hardware Reinforcing: Minimum 1.5 mm (0.059 inch) thick.

3. Where concealed hardware is specified, provide space, cutouts, and reinforcement for installation and secure fastening.

D. Factory assembled doors.

2.9 FINISHES

A. Aluminum Anodized Finish: NAAMM AMP 500.

1. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.

2.10 ACCESSORIES

A. Dielectric Tape: Plastic, non-absorptive, with pressure sensitive adhesive; 0.18 to 0.25 mm (7 to 10 mils) thick.

B. Barrier Coating: ASTM D1187/D1187M.

C. Welding Materials: AWS D1.2/D1.2M, type to suit application.

D. Fasteners:

1. Aluminum: ASTM F468, Alloy 2024.
2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

E. Anchors: Aluminum or stainless steel; type to suit application.

F. Galvanizing Repair Paint: MPI No. 18.

G. Touch-Up Paint: Match shop finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

1. Coordinate floor closer installation recessed into concrete slabs.
2. Coordinate anchor installation built into masonry and concrete.

B. Protect existing construction and completed work from damage.

C. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

D. Apply dielectric tape or barrier coating to aluminum surfaces in contact with dissimilar metals and cementitious materials to minimum 0.7 mm (30 mils) dry film thickness.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.

1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Install aluminum framed entrances and storefronts plumb and true, in alignment and to lines shown on drawings.

C. Anchor frames to adjoining construction at heads, jambs and sills.

D. Provide concealed aluminum clips to connect adjoining frame sections.

E. Install door hardware and hang doors. See Section 08 71 00, DOOR HARDWARE.

F. Adjust doors and hardware uniform clearances and proper operation.

G. Touch up damaged factory finishes.

1. Repair galvanized surfaces with galvanized repair paint.
2. Repair painted surfaces with touch up primer.

H. Tolerances:

1. Variation from Plumb, Level, Warp, and Bow: Maximum 3 mm in 3 meters (1/8 inch in 10 feet).
2. Variation from Plane: Maximum3 mm in 3.65 meters (1/8 inch in 12 feet); 6 mm (1/4 inch) over total length.
3. Variation from Alignment: Maximum 1.5 mm (1/16 inch) in-line offset and maximum3 mm (1/8 inch) corner offset.
4. Variation from Square: Maximum 3 mm (1/8 inch) diagonal measurement differential.

3.3 PROTECTION, CLEANING AND REPAIRING

A. Clean exposed aluminum and glass surfaces. Remove contaminants and stains.

B. Protect aluminum-framed entrances and storefronts from construction operations.

C. Remove protective materials immediately before acceptance.

D. Repair damage.

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SECTION 08 71 00
DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Door hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

A. Caulking: Section 07 92 00 JOINT SEALANTS.

B. Application of Hardware: Section 08 14 00, WOOD DOORS Section 08 11 13, HOLLOW METAL DOORS AND FRAMES Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS Section 08 71 13.11, LOW ENERGY DOOR OPERATORS Section

C. Finishes: As shown on drawings.

D. Painting: Section 09 91 00, PAINTING.

E. Card Readers: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS.

F. Electrical: Division 26, ELECTRICAL.

G. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 GENERAL

A. All hardware shall comply with ABAAS, (Architectural Barriers Act Accessibility Standard) unless specified otherwise.

B. Provide rated door hardware assemblies where required by most current version of the International Building Code (IBC).

C. Hardware for Labeled Fire Doors and Exit Doors: Conform to requirements of NFPA 80 for labeled fire doors and to NFPA 101 for exit doors, as well as to other requirements specified. Provide hardware listed by UL, except where heavier materials, large size, or better grades are specified herein under paragraph HARDWARE SETS. In lieu of UL labeling and listing, test reports from a nationally recognized testing agency may be submitted showing that hardware has been tested in accordance with UL test methods and that it conforms to NFPA requirements.

D. Hardware for application on metal and wood doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.

E. The following items shall be of the same manufacturer, except as otherwise specified:

1. Mortise locksets.

2. Hinges for hollow metal and wood doors.
3. Surface applied overhead door closers.
4. Exit devices.
5. Floor closers.

1.4 WARRANTY

A. Automatic door operators shall be subject to the terms of FAR Clause 52.246-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:

1. Locks, latchsets, and panic hardware: 5 years.
2. Door closers and continuous hinges: 10 years.

1.5 MAINTENANCE MANUALS

A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware. Provide installation instructions with the submittal documentation.

1.6 SUBMITTALS

A. Submittals shall be in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23. Submit 2 final copies of the final approved schedules to VAMC Locksmith as record copies (VISN Locksmith if the VAMC does not have a locksmith).

B. Hardware Schedule: AHC certified hardware consultant to prepare and submit hardware schedule in the following form:

Hardware Item	Quantity	Size	Reference Publication Type No.	Finish	Mfr. Name and Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

C. Samples and Manufacturers' Literature:

1. Samples: All hardware items (proposed for the project) that have not been previously approved by Builders Hardware Manufacturers Association shall be submitted for approval. Tag and mark all items with manufacturer's name, catalog number and project number.

2. Samples are not required for hardware listed in the specifications by manufacturer's catalog number, if the contractor proposes to use the manufacturer's product specified.

D. Certificate of Compliance and Test Reports: Submit certificates that hardware conforms to the requirements specified herein. Certificates shall be accompanied by copies of reports as referenced. The testing shall have been conducted either in the manufacturer's plant and certified by an independent testing laboratory or conducted in an independent laboratory, within four years of submittal of reports for approval.

E. Record of opening force measurement for all doors equipped with closers

1.7 DELIVERY AND MARKING

A. Deliver items of hardware to job site in their original containers, complete with necessary appurtenances including screws, keys, and instructions. Tag one of each different item of hardware and deliver to COR for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in COR's office until all other similar items have been installed in project, at which time the COR will deliver items on file to Contractor for installation in predetermined locations on the project.

1.8 PREINSTALLATION MEETING

A. Convene a preinstallation meeting not less than 30 days before start of installation of door hardware. Require attendance of parties directly affecting work of this section, including Contractor and Installer, Architect, COR and VA Locksmith, Hardware Consultant, and Hardware Manufacturer’s Representative. Review the following:

1. Inspection of door hardware.
2. Job and surface readiness.
3. Coordination with other work.
4. Protection of hardware surfaces.
5. Substrate surface protection.
6. Installation.
7. Adjusting.
8. Repair.
9. Field quality control.
10. Cleaning.

1.9 INSTRUCTIONS

A. Hardware Set Symbols on Drawings: Except for protective plates, door stops, mutes, thresholds and the like specified herein, hardware requirements for each door are indicated on drawings by symbols. Symbols for hardware sets consist of letters (e.g., "HW") followed by a number. Each number designates a set of hardware items applicable to a door type.

B. Keying: All cylinders shall be keyed into existing key system. Provide removable core cylinders that are removable only with a special key or tool without disassembly of knob or lockset. Cylinders shall be 7 pin type. Keying information shall be furnished at a later date by the COR.

C. Keying: A new Great Grandmaster key shall be established for this project. The key system shall be small format (Best size and profile) removable core type as previously described. The key blanks shall be protected by a utility patent with a minimum seven years remaining on the patent from the start of construction, and protected by contract-controlled distribution. The manufacturer shall furnish code pattern listings in both paper and electronic formats so keys may be reproduced by code.; provide electronic format in file type required by project’s key control software. The manufacturer shall design the new key system with the capacity to rekey the existing system and also provide for 25 percent expansion capability beyond this requirement. Submit a keying chart for approval showing proposed keying layout and listing expansion capacity.

1. Keying information will be furnished to the Contractor by the COR.
2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify COR immediately when and to whom keys or keying information is supplied. Return all such keys to the COR.

1.10 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. In text, hardware items are referred to by series, types, etc., listed in such specifications and standards, except as otherwise specified.

B. ASTM International(ASTM):

F883-22.....Padlocks

E2180-20.....Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials

C. American National Standards Institute/Builders Hardware Manufacturers Association (ANSI/BHMA):

A156.1-20.....Butts and Hinges

A156.2-20.....Bored and Pre-assembled Locks and Latches

A156.3-21.....Exit Devices, Coordinators, and Auto Flush Bolts

A156.4-20.....Door Controls (Closers)

A156.5-21.....Cylinders and Input Devices for Locks.

A156.6-20.....Architectural Door Trim

A156.8-20.....Door Controls-Overhead Stops and Holders

A156.11-20.....Cabinet Locks

A156.12-20 .....Interconnected Locks and Latches

A156.13-20.....Mortise Locks and Latches Series 1000

A156.14-20 .....Sliding and Folding Door Hardware

A156.15-20.....Release Devices-Closer Holder, Electromagnetic and Electromechanical

A156.16-20.....Auxiliary Hardware

A156.17-20 .....Self-Closing Hinges and Pivots

A156.18-20.....Materials and Finishes

A156.20-20 .....Strap and Tee Hinges, and Hasps

A156.21-20.....Thresholds

A156.22-20.....Door Gasketing and Edge Seal Systems

A156.23-20.....Electromagnetic Locks

A156.24-20.....Delayed Egress Locking Systems

A156.25-20 .....Electrified Locking Devices

A156.26-20.....Continuous Hinges

A156.28-20 .....Master Keying Systems

A156.29-20 .....Exit Locks and Alarms

A156.30-03 .....High Security Cylinders

A156.31-07 .....Electric Strikes and Frame Mounted Actuators

A156.36-10.....Auxiliary Locks

A250.8-20.....Standard Steel Doors and Frames

D. National Fire Protection Association (NFPA):

80-22.....Fire Doors and Other Opening Protectives

101-24.....Life Safety Code

E. Underwriters Laboratories, Inc. (UL):

Building Materials Directory (2008)

F. Architectural Barriers Act Accessibility Standards (ABAAS)

PART 2 - PRODUCTS

2.1 BUTT HINGES

A. ANSI A156.1. Provide only three-knuckle hinges, except five-knuckle where the required hinge type is not available in a three-knuckle version (e.g., some types of swing-clear hinges). The following types of butt hinges shall be used for the types of doors listed, except where otherwise specified:

1. Exterior Doors: Type A2112/A5112 for doors 900 mm (3 feet) wide or less and Type A2111/A5111 for doors over 900 mm (3 feet) wide. Hinges for exterior outswing doors shall have non-removable pins. Hinges for exterior fire-rated doors shall be of stainless steel material.
2. Interior Doors: Type A8112/A5112 for doors 900 mm (3 feet) wide or less and Type A8111/A5111 for doors over 900 mm (3 feet) wide. Hinges for doors exposed to high humidity areas (shower rooms, toilet rooms, kitchens, janitor rooms, etc. shall be of stainless steel material.

B. Provide quantity and size of hinges per door leaf as follows:

1. Doors up to 1210 mm (4 feet) high: 2 hinges.
2. Doors 1210 mm (4 feet) to 2260 mm (7 feet 5 inches) high: 3 hinges minimum.
3. Doors greater than 2260 mm (7 feet 5 inches) high: 4 hinges.
4. Doors up to 900 mm (3 feet) wide, standard weight: 114 mm x 114 mm (4-1/2 inches x 4-1/2 inches) hinges.
5. Doors over 900 mm (3 feet) to 1065 mm (3 feet 6 inches) wide, standard weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
6. Doors over 1065 mm (3 feet 6 inches) to 1210 mm (4 feet), heavy weight: 127 mm x 114 mm (5 inches x 4-1/2 inches).
7. Provide heavy-weight hinges where specified.
8. At doors weighing 330 kg (150 pounds) or more, furnish 127 mm (5 inch) high hinges.

C. See Articles "MISCELLANEOUS HARDWARE" and "HARDWARE SETS" for pivots and hinges other than butts specified above and continuous hinges specified below.

2.2 CONTINUOUS HINGES

A. ANSI/BHMA A156.26, Grade 1-600.

1. Listed under Category N in BHMA's "Certified Product Directory."

B. General: Minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete

C. Continuous, Barrel-Type Hinges: Hinge with knuckles formed around a Teflon-coated 6.35mm (0.25-inch) minimum diameter pin that extends entire length of hinge.

1. Base Metal for Exterior Hinges: Stainless steel.
2. Base Metal for Interior Hinges: Stainless steel.
3. Base Metal for Hinges for Fire-Rated Assemblies: Stainless steel.
4. Provide with non-removable pin (hospital tip option) at lockable outswing doors.
5. Where required to clear adjacent casing, trim, and wall conditions and allow full door swing, provide wide throw hinges of minimum width required.
6. Provide with manufacturer’s cut-outs for separate mortised power transfers and/or mortised automatic door bottoms where they occur.
7. Where thru-wire power transfers are integral to the hinge, provide hinge with easily removable portion to allow easy access to wiring connections.
8. Where models are specified that provide an integral wrap-around edge guard for the hinge edge of the door, provide manufacturer’s adjustable threaded stud and machine screw mechanism to allow the door to be adjusted within the wrap-around edge guard.

2.3 DOOR CLOSING DEVICES

A. Closing devices shall be products of one manufacturer for each type specified.

2.4 OVERHEAD CLOSERS

A. Conform to ANSI A156.4, Grade 1.

B. Closers shall conform to the following:

1. The closer shall have minimum 50 percent adjustable closing force over minimum value for that closer and have adjustable hydraulic back check effective between 60 degrees and 85 degrees of door opening.
2. Where specified, closer shall have hold-open feature.
3. Size Requirements: Provide multi-size closers, sizes 1 through 6, except where multi-size closer is not available for the required application.
4. Material of closer body shall be forged or cast.
5. Arm and brackets for closers shall be steel, malleable iron or high strength ductile cast iron.
6. Where closers are exposed to the exterior or are mounted in rooms that experience high humidity, provide closer body and arm assembly of stainless steel material.
7. Closers shall have full size metal cover; plastic covers will not be accepted.
8. Closers shall have adjustable hydraulic back-check, separate valves for closing and latching speed, adjustable back-check positioning valve, and adjustable delayed action valve.
9. Provide closers with any accessories required for the mounting application, including (but not limited to) drop plates, special soffit plates, spacers for heavy-duty parallel arm fifth screws, bull-nose or other regular arm brackets, longer or shorter arm assemblies, and special factory templating. Provide special arms, drop plates, and templating as needed to allow mounting at doors with overhead stops and/or holders.
10. Closer arms or backcheck valve shall not be used to stop the door from overswing, except in applications where a separate wall, floor, or overhead stop cannot be used.
11. Provide parallel arm closers with heavy duty rigid arm.
12. Where closers are to be installed on the push side of the door, provide parallel arm type except where conditions require use of top jamb arm.
13. Provide all surface closers with the same body attachment screw pattern for ease of replacement and maintenance.
14. All closers shall have a 1 ½" (38mm) minimum piston diameter.

2.5 FLOOR CLOSERS AND FLOOR PIVOT SETS

2.6 DOOR STOPS

A. Conform to ANSI A156.16.

B. Provide door stops wherever an opened door or any item of hardware thereon would strike a wall, column, equipment or other parts of building construction. For concrete, masonry or quarry tile construction, use expansion shields for mounting door stops.

C. Where cylindrical locks with turn pieces or pushbuttons occur, equip wall bumpers Type L02251 (rubber pads having concave face) to receive turn piece or button.

D. Provide floor stops (Type L02141 or L02161) in office areas; Type L02121 x 3 screws into floor elsewhere. Wall bumpers, where used, must be installed to impact the trim or the door within the leading half of its width. Floor stops, where used, must be installed within 4-inches of the wall face and impact the door within the leading half of its width.

E. Where drywall partitions occur, use floor stops, Type L02141 or L02161 in office areas, Type L02121 elsewhere.

F. Provide stop Type L02011, as applicable for exterior doors. At outswing doors where stop can be installed in concrete, provide stop mated to concrete anchor set in 76mm (3-inch) core-drilled hole and filled with quick-setting cement.

G. Omit stops where floor mounted door holders are required and where automatic operated doors occur.

H. Provide appropriate roller bumper for each set of doors (except where closet doors occur) where two doors would interfere with each other in swinging.

I. Provide appropriate door mounted stop on doors in individual toilets where floor or wall mounted stops cannot be used.

J. Provide overhead surface applied stop Type C02541, ANSI A156.8 on patient toilet doors in bedrooms where toilet door could come in contact with the bedroom door.

K. Provide door stops on doors where combination closer magnetic holders are specified, except where wall stops cannot be used or where floor stops cannot be installed within 4-inches of the wall.

L. Where the specified wall or floor stop cannot be used, provide concealed overhead stops (surface-mounted where concealed cannot be used).

2.7 OVERHEAD DOOR STOPS AND HOLDERS

A. Conform to ANSI Standard A156.8. Overhead holders shall be of sizes recommended by holder manufacturer for each width of door. Set overhead holders for 110 degree opening, unless limited by building construction or equipment. Provide Grade 1 overhead concealed slide type: stop-only at rated doors and security doors, hold-open type with exposed hold-open on/off control at all other doors requiring overhead door stops.

2.8 FLOOR DOOR HOLDERS

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2.9 LOCKS AND LATCHES

A. Conform to ANSI A156.2. Locks and latches for doors 45 mm (1-3/4 inch) thick or over shall have beveled fronts. Lock cylinders shall have not less than seven pins. Cylinders for all locksets shall be removable core type. Cylinders shall be furnished with construction removable cores and construction master keys. Cylinder shall be removable by special key or tool. Construct all cores so that they will be interchangeable into the core housings of all mortise locks, rim locks, cylindrical locks, and any other type lock included in the Great Grand Master Key System. Disassembly of lever or lockset shall not be required to remove core from lockset. All locksets or latches on double doors with fire label shall have latch bolt with 19 mm (3/4 inch) throw, unless shorter throw allowed by the door manufacturer’s fire label. Provide temporary keying device or construction core to allow opening and closing during construction and prior to the installation of final cores.

B. In addition to above requirements, locks and latches shall comply with following requirements:

1. Mortise Lock and Latch Sets: Conform to ANSI/BHMA A156.13. Mortise locksets shall be series 1000, minimum Grade 2. All locksets and latchsets, except on designated doors in Psychiatric (Mental Health) areas, shall have lever handles fabricated from cast stainless steel. Provide sectional (lever x rose) lever design matching [_____]. No substitute lever material shall be accepted. All locks and latchsets shall be furnished with 122.55 mm (4-7/8-inch) curved lip strike and wrought box. At outswing pairs with overlapping astragals, provide flat lip strip with 21mm (7/8-inch) lip-to-center dimension. Lock function F02 shall be furnished with emergency tools/keys for

emergency entrance. All lock cases installed on lead lined doors shall be lead lined before applying final hardware finish. Furnish armored fronts for all mortise locks. Where mortise locks are installed in high-humidity locations or where exposed to the exterior on both sides of the opening, provide non-ferrous mortise lock case.

2. Auxiliary locks shall be as specified under hardware sets and conform to ANSI A156.36.
3. Locks on designated doors in Psychiatric (Mental Health) areas shall be paddle type with arrow projection covers and be UL Listed. Provide these locks with paddle in the down position on both sides of the door. Locks shall be fabricated of wrought stainless steel.

2.10 PUSH-BUTTON COMBINATION LOCKS

A. ANSI/BHMA A156.5, Grade 1. Battery operated pushbutton entry.

B. Construction: Heavy duty mortise lock housing conforming to ANSI/BHMA A156.13, Grade 1. Lever handles and operating components in compliance with the ABAAS and the ADA Accessibility Guidelines. Match lever handles of locks and latchsets on adjacent doors.

C. Special Features: Key override to permit a master keyed security system and a pushbutton security code activated passage feature to allow access without using the entry code.

2.11 ELECTROMAGNETIC LOCKS

A. ANSI/BHMA A156.23; electrically powered, of strength and configuration indicated; with electromagnet attached to frame and armature plate attached to door. Listed under Category E in BHMA's "Certified Product Directory."

1. Type: Full exterior or full interior, as required by application indicated.
2. Strength Ranking: 1500 pound force (6672 N)
3. Inductive Kickback Peak Voltage: Not more than 53 V.
4. Residual Magnetism: Not more than 4 pound force (18 N) to separate door from magnet.

B. Delayed-Egress Locks: BHMA A156.24. Listed under Category G in BHMA's "Certified Product Directory".

1. Means of Egress Doors: Lock releases within 15 seconds after applying a force not more than 15 pound force (67 N) for not more than 3 seconds, as required by NFPA 101.

2. Security Grade: Activated from secure side of door by initiating device.
3. Movement Grade: Activated by door movement as initiating device.
4. The lock housing shall not project more than 4-inches (101mm) from the underside of the frame head stop.

2.12 ELECTRIC STRIKES

A. ANSI/ BHMA A156.31 Grade 1.

B. General: Use fail-secure electric strikes at fire-rated doors.

2.13 KEYS

A. Stamp all keys with change number and key set symbol. Furnish keys in quantities as follows:

Locks/Keys	**Quantity**
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

2.14 KEY CABINET

2.15 ARMOR PLATES, KICK PLATES, MOP PLATES AND DOOR EDGING

A. Conform to ANSI Standard A156.6.

B. Provide protective plates and door edging as specified below:

1. Kick plates, mop plates and armor plates of metal, Type J100 series.
2. Provide kick plates and mop plates where specified. Kick plates shall be 254 mm (10 inches) or 305 mm (12 inches) high. Mop plates shall be 152 mm (6 inches) high. Both kick and mop plates shall be minimum 1.27 mm (0.050 inches) thick. Provide kick and mop plates beveled on all 4 edges (B4E). On push side of doors where jamb stop extends to floor, make kick plates 38 mm (1-1/2 inches) less than width of door, except pairs of metal doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other kick and mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick and mop plates

shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.

3. Kick plates and/or mop plates are not required on following door sides:
   a. Armor plate side of doors;
   b. Exterior side of exterior doors;
   c. Closet side of closet doors;
   d. Both sides of aluminum entrance doors.
4. Armor plates for doors are listed under Article "Hardware Sets". Armor plates shall be thickness as noted in the hardware set, 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. Provide armor plates beveled on all 4 edges (B4E). Plates on pairs of metal doors shall be 25 mm (1 inch) less than width of each door. Where top of intermediate rail of door is less than 875 mm (35 inches) from door bottom, extend armor plates to within 13 mm (1/2 inch) of top of intermediate rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt push bar.
5. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick plate in place of armor plate. Size of stretcher plate and kick plate shall be 254 mm (10 inches) high.
6. Provide stainless steel edge guards where so specified at wood doors. Provide mortised type instead of surface type except where door construction and/or ratings will not allow. Provide edge guards of bevel and thickness to match wood door. Provide edge guards with factory cut-outs for door hardware that must be installed through or extend through the edge guard. Provide full-height edge guards except where door rating does not allow; in such cases, provide edge guards to height of bottom of typical lockset armor front. Forward edge guards to wood door manufacturer for factory installation on doors.

2.16 EXIT DEVICES

A. Conform to ANSI Standard A156.3. Exit devices shall be Grade 1; type and function are specified in hardware sets. Provide flush with finished floor strikes for vertical rod exit devices in interior of building. Trim shall have cast satin stainless steel lever handles of design similar to locksets, unless

otherwise specified. Provide key cylinders for keyed operating trim and, where specified, cylinder dogging.

B. Surface vertical rod panics shall only be provided less bottom rod; provide fire pins as required by exit device and door fire labels. Do not provide surface vertical rod panics at exterior doors.

C. Concealed vertical rod panics shall be provided less bottom rod at interior doors, unless lockable or otherwise specified; provide fire pins as required by exit device and door fire labels. Where concealed vertical rod panics are specified at exterior doors, provide with both top and bottom rods.

D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.

E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.

F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.17 FLUSH BOLTS (LEVER EXTENSION)

A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.

B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.

C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).

D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.

E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).

2.18 FLUSH BOLTS (AUTOMATIC)

A. Conform to ANSI A156.3. Dimension of flush bolts shall conform to ANSI A115. Bolts shall conform to Underwriters Laboratories, Inc., requirements for fire door hardware. Flush bolts shall automatically latch and unlatch. Furnish dustproof strikes conforming to ANSI A156.16 for bottom flushbolt. Face plates for dustproof strike shall be rectangular and not less than 38 mm by 90 mm (1-1/2 by 3-1/2 inches).

B. At interior doors, provide auto flush bolts less bottom bolt, unless otherwise specified, except at wood pairs with fire-rating greater than 20

minutes; provide fire pins as required by auto flush bolt and door fire labels.

2.19 LIGATURE RESISTANT DOOR ALARM:

2.20 DOOR PULLS WITH PLATES

A. Conform to ANSI A156.6. Pull Type J401, 152 mm CTC (6 inches CTC) length by 19 mm (3/4 inches) diameter minimum with plate Type J302, 90 mm by 381 mm (3-1/2 inches by 15 inches), unless otherwise specified. Provide pull with projection of 57.2 mm (2 1/4 inches) minimum and a clearance of 38.1 mm (1 1/2 inches) minimum. Cut plates of door pull plate for cylinders, or turn pieces where required.

2.21 PUSH PLATES

A. Conform to ANSI A156.6. Metal, Type J302, 203 mm (8 inches) wide by 406.4 mm (16 inches) high. Provide metal Type J302 plates 102 mm (4 inches) wide by 406.4 mm (16 inches) high where push plates are specified for doors with stiles less than 203 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.22 COMBINATION PUSH AND PULL PLATES

A. Conform to ANSI 156.6. Type J303, stainless steel 3 mm (1/8 inch) thick, 80 mm (3-1/3 inches) wide by 800 mm (16 inches) high), top and bottom edges shall be rounded. Secure plates to wood doors with 38 mm (1-1/2 inch) long No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

2.23 COORDINATORS

A. Conform to ANSI A156.16. Coordinators, when specified for fire doors, shall comply with Underwriters Laboratories, Inc., requirements for fire door hardware. Coordinator may be omitted on exterior pairs of doors where either door will close independently regardless of the position of the other door. Coordinator may be omitted on interior pairs of non-labeled open where open back strike is used. Open back strike shall not be used on labeled doors. Paint coordinators to match door frames, unless coordinators are plated. Provide bar type coordinators, except where gravity coordinators are required at acoustic pairs. For bar type coordinators, provide filler bars for full width and, as required, brackets for push-side surface mounted closers, overhead stops, and vertical rod panic strikes.

2.24 THRESHOLDS

2.25 AUTOMATIC DOOR BOTTOM SEAL AND RUBBER GASKET FOR LIGHT PROOF OR SOUND CONTROL DOORS

A. Conform to ANSI A156.22. Provide mortise or under-door type, except where not practical. For mortise automatic door bottoms, provide type specific for door construction (wood or metal).

2.26 WEATHERSTRIPS (FOR EXTERIOR DOORS)

2.27 MISCELLANEOUS HARDWARE

A. Access Doors (including Sheet Metal, Screen and Woven Wire Mesh Types): Except for fire-rated doors and doors to Temperature Control Cabinets, equip each single or double metal access door with Lock Type E07213, conforming to ANSI A156.11. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.

B. Mutes: Conform to ANSI A156.16. Provide door mutes or door silencers Type L03011 or L03021, depending on frame material, of white or light gray color, on each steel or wood door frame, except at fire-rated frames, lead-lined frames and frames for sound-resistant, lightproof and electromagnetically shielded doors. Furnish 3 mutes for single doors and 2 mutes for each pair of doors, except double-acting doors. Provide 4 mutes or silencers for frames for each Dutch type door. Provide 2 mutes for each edge of sliding door which would contact door frame.

2.28 PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES

2.29 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS

2.30 HINGED WIRE GUARDS (FOR WINDOWS, DOORS AND TRANSOMS) AND WIRE PARTITION DOORS

2.31 FINISHES

A. Exposed surfaces of hardware shall have ANSI A156.18, finishes as specified below. Finishes on all hinges, pivots, closers, thresholds, etc., shall be as specified below under "Miscellaneous Finishes." For field painting (final coat) of ferrous hardware, see Section 09 91 00, PAINTING.

B. 626 or 630: All surfaces on exterior and interior of buildings, except where other finishes are specified.

C. Miscellaneous Finishes:

1. Hinges --exterior doors: 626 or 630.
2. Hinges --interior doors: 652 or 630.
3. Pivots: Match door trim.

4. Door Closers: Factory applied paint finish. Dull or Satin Aluminum color.
5. Thresholds: Mill finish aluminum.
6. Cover plates for floor hinges and pivots: 630.
7. Other primed steel hardware: 600.

D. Hardware Finishes for Existing Buildings: U.S. Standard finishes shall match finishes of hardware in (similar) existing spaces except where otherwise specified.

E. Special Finish: Exposed surfaces of hardware for dark bronze anodized aluminum doors shall have oxidized oil rubbed bronze finish (dark bronze) finish on door closers shall closely match doors.

F. Anti-microbial Coating: All hand-operated hardware (levers, pulls, push bars, push plates, paddles, and panic bars) shall be provided with an anti-microbial/anti-fungal coating that has passed ASTM E2180 tests. Coating to consist of ionic silver (Ag+). Silver ions surround bacterial cells, inhibiting growth of bacteria, mold, and mildew by blockading food and respiration supplies.

2.32 BASE METALS

A. Apply specified U.S. Standard finishes on different base metals as following:

Finish	**Base Metal**
652	Steel
626	Brass or bronze
630	Stainless steel

PART 3 - EXECUTION

3.1 HARDWARE HEIGHTS

A. For existing buildings locate hardware on doors at heights to match existing hardware. The Contractor shall visit the site, verify location of existing hardware and submit locations to VA COR for approval.

B. Hardware Heights from Finished Floor:

1. Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
2. Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).

3. Deadlocks centerline of strike 1219 mm (48 inches).
4. Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
5. Centerline of door pulls to be 1016 mm (40 inches).
6. Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
7. Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
8. Locate other hardware at standard commercial heights. Locate push and pull plates to prevent conflict with other hardware.

3.2 INSTALLATION

A. Closer devices, including those with hold-open features, shall be equipped and mounted to provide maximum door opening permitted by building construction or equipment. Closers shall be mounted on side of door inside rooms, inside stairs, and away from corridors Measure and adjust opening force for all doors equipped with closers.

B. Hinge Size Requirements:

Door Thickness	**Door Width**	**Hinge Height**
45 mm (1-3/4 inch)	900 mm (3 feet) and less	113 mm (4-1/2 inches)
45 mm (1-3/4 inch)	Over 900 mm (3 feet) but not more than 1200 mm (4 feet)	125 mm (5 inches)
35 mm (1-3/8 inch) (hollow core wood doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.

D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by COR. Existing hinges shall not be reused on door openings having new doors and new frames. Coordinate preparation for hinge cut-outs and screw-hole locations on doors and frames.

E. Hinges Required Per Door:

Door Description	**Number butts**
Doors 1500 mm (5 ft) or less in height	2 butts
Doors over 1500 mm (5 ft) high and not over 2280 mm (7 ft 6 in) high	3 butts
Doors over 2280 mm (7 feet 6 inches) high	4 butts
Dutch type doors	4 butts
Doors with spring hinges 1370 mm (4 feet 6 inches) high or less	2 butts
Doors with spring hinges over 1370 mm (4 feet 6 inches)	3 butts

F. Fastenings: Suitable size and type and shall harmonize with hardware as to material and finish. Provide machine screws and lead expansion shields to secure hardware to concrete, ceramic or quarry floor tile, or solid masonry. Fiber or rawl plugs and adhesives are not permitted. All fastenings exposed to weather shall be of nonferrous metal.

G. After locks have been installed; show in presence of COR that keys operate their respective locks in accordance with keying requirements. (All keys, Master Key level and above shall be sent Registered Mail to the Medical Center Director along with the bitting list. Also a copy of the invoice shall be sent to the COR for his records.) Installation of locks which do not meet specified keying requirements shall be considered sufficient justification for rejection and replacement of all locks installed on project.

3.3 FINAL INSPECTION

A. Installer to provide letter to VA COR that upon completion, installer has visited the Project and has accomplished the following:

1. Re-adjust hardware.
2. Evaluate maintenance procedures and recommend changes or additions, and instruct VA personnel.
3. Identify items that have deteriorated or failed.
4. Submit written report identifying problems.

3.4 DEMONSTRATION

A. Demonstrate efficacy of mechanical hardware and electrical, and electronic hardware systems, including adjustment and maintenance procedures, to satisfaction of COR and VA Locksmith.

3.5 HARDWARE SETS

A. Following sets of hardware correspond to hardware symbols shown on drawings. Only those hardware sets that are shown on drawings will be required. Disregard hardware sets listed in specifications but not shown on drawings.

B. Hardware Consultant working on a project will be responsible for providing additional information regarding these hardware sets. The numbers shown in the following sets come from BHMA standards.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:

ADO = Automatic Door Operator

EMCH = Electro-Mechanical Closer-Holder

MHO = Magnetic Hold-Open (wall- or floor-mounted)

C. INTERIOR SINGLE DOORS

HW-1

Each Door to Have:	NON-RATED
1 Continuous Hinge	-
1 Door Pull w/ Plate	J401 x J302
1 Push Plate	J302
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
3 Silencers	L03011

HW-1A

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Latchset	F01
1 Closer	C02011/C02021 x INSTALL OUTSIDE ROOM
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)

1	Auto Door Bottom	R0Y346 - HEAVY DUTY
1	Set Seals	R0Y164

HW-1B

Each Door to Have:	NON-RATED/RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X SWING-CLEAR X ADJUSTA-SCREWS
1 Hospital Latch	F01 x PADDLES POINTING DOWN
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Seals	R0Y164

NO CLOSER REQUIRED DUE TO EXEMPTION FOR PATIENT ROOM DOORS.

HW-1C

THIS SET NOT USED.

HW-1D

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X SWING-CLEAR X ADJUSTA-SCREWS
1 Hospital Latch	F01 x PADDLES POINTING DOWN
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Mop Plate	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
3 Silencers	L03011

HW-1E

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Hospital Latch	F01 x PADDLES POINTING DOWN
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH)THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Wall Stop (@ Inswing Doors)	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

HW-1F

Each Door to Have:	NON-RATED
1 Continuous Hinge	-
1 Latchset	F04
1 Kick Plate	J102
1 Wall Stop	L02101 CONVEX
3 Silencers	L03011

HW-1G

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Latchset	F01
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Wall Stop	L02101 CONVEX
3 Silencers	L03011
1 Coat Hook	L03121

HW-1H

Each Dwarf Door to Have:	NON-RATED
1 Gate Spring Pivot Hinge	K13311
1 Door Bolt	L04151
1 Wall Stop	L02101 CONVEX
2 Silencers	L03021

HW-1J

Each [MHO] Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Latchset	F01
1 Closer	C02011/C02021
1 Heavy-Duty Armor Plate	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Magnetic Holder	C00011 TRI-VOLTAGE
1 Set Self-Adhesive Seals	R0Y154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-1K

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL
	X ADJUSTA-SCREWS
1 Hospital Latch	F01 x PADDLES POINTING DOWN
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-1L (EXAM, IMAGING ROOMS)

Each Door to Have:	NON-RATED
1 Continuous Hinge	-
1 Latchset	F04
1 Kick Plate	J102
1 Wall Stop	L02101 CONVEX
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-1M

Each Door to Have:	NON-RATED
1 Floor Closer	C06011
2 Push Plates	J302
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J209M / J212 (VERIFY)
1 Overhead Stop	C01541-ADJUSTABLE

HW-1N

Each Door to Have:	NON-RATED
1 Continuous Hinge	-
1 Door Pull w/ Plate	J401 x J302
1 Push Plate	J302
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
3 Silencers	L03011

HW-IP

Each Lead-Lined Door to Have:	NON-RATED
1 Floor Closer	C6062
2 Push Plates	J302 8” x 16”
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J209M / J212 (VERIFY)
1 Overhead Stop	C01541-ADJUSTABLE

HW-1Q

Each Door to Have:	RATED/NON-RATED
1 Continuous Hinge	-
1 Latchset	F04
1 Kick Plate	J102
1 Closer (@ rated doors)	C02011/C02021
1 Wall Stop	L02101 CONVEX
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-1R

Each Door to Have:	RATED/NON-RATED
1 Continuous Hinge	-
1 Latchset	F04
1 Kick Plate	J102
1 Closer (@ rated doors)	C02011/C02021
1 Wall Stop	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

HW-2

Each Door to Have:	RATED/NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Keyed Privacy Indicator Lock	F13 x OCCUPANCY INDICATOR
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-2A

Each [ADO] Door to Have:	RATED/NON-RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Keyed Privacy Indicator Lock	F13 x OCCUPANCY INDICATOR
1 Electric Strike	E09391 (FAIL-SECURE), 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS. STONE THRESHOLD BY OTHER TRADES.

HW-2B

Each Door to Have:	NON-RATED
1 Center Pivot Set	C07042
1 Privacy Lock	F02 X OCCUPANCY INDICATOR
1 Rescue Stop	A1882
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Wall Stop	L02101 CONVEX

STONE THRESHOLD BY OTHER TRADES.

HW-2C

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Privacy Lock	F02-MOD X OCCUPANCY INDICATOR
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Wall Stop	L02101 CONVEX
3 Silencers	L03011

STONE THRESHOLD BY OTHER TRADES.

HW-2D

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Privacy Lock	F02-MOD X OCCUPANCY INDICATOR
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Wall Stop	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-2E

Each Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Hospital Privacy Latch	F02
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Mop Plate (@ Inswing Doors)	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-2F

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Privacy Lock	F02-MOD X OCCUPANCY INDICATOR
1 Wall Stop	L02101 CONVEX
3 Silencers	L03011
1 Coat Hook	L03121

HW-2G (TOILETS)

Each Door to Have:	RATED/NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Keyed Privacy Indicator Lock	F13 x OCCUPANCY INDICATOR
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop	L02121 x 3 FASTENERS
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-2H

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Hospital Privacy Latch	F02 X OCCUPANCY INDICATOR
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
3 Silencers	L03011

STONE THRESHOLD BY OTHER TRADES.

HW-2J

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Privacy Lock	F02-MOD X OCCUPANCY INDICATOR
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Wall Stop	L02101 CONVEX
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-2K

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Hospital Privacy Latch	F02 X OCCUPANCY INDICATOR
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

STONE THRESHOLD BY OTHER TRADES.

HW-3

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-3A

THIS SET NOT USED.

HW-3B

Each Door to Have:	NON-RATED/RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
1 Door Viewer	L03221 – 190° (VIEW INTO CORRIDOR)
1 Set Self-Adhesive Seals	R0Y154

OMIT VIEWER IF DOOR PROVIDED WITH VISION LITE.

HW-3C

THIS SET NOT USED.

HW-3D

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-3E (RECEPTION)

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
1 Coat Hook	L03121

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-3F

Each Door to Have:	RATED/NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Office Lock	F04
1 Closer	CO2011/CO2021 @ RATED DOOR
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-3G (OFFICES)

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Floor Stop	L02121 x 3 FASTENERS
1 Coat Hook	L03121
1 Door Viewer (Mental Health Only)	L03221 90 degree (VIEW INTO CORRIDOR)
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

OMIT VIEWER IF DOOR PROVIDED WITH VISION LITE.

OMIT COAT HOOK WHERE GLASS LITE PREVENTS INSTALLATION.

HW-3H

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Office Lock	F04
1 Closer	CO2011/CO2021
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Sets Self-Adhesive Seals	R0Y154

HW-3J

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Office Lock	F04
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
1 Set Sound/Light Seals	R0Y264/R0Y255

HW-4

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Classroom Lock	F05
1 Overhead Stop	C04541
3 Silencers	L03011

HW-4A

Each [ADO] Door to Have:	RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Classroom Lock	F05
1 Electric Strike	E09311 (FAIL-SECURE), 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103 @ TOILET ROOMS ONLY
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFER FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-4B

Each Door to Have:	NON-RATED
1 Continuous Hinge	-
1 Public Restroom Lock	F09
1 Closer	C02011/C02021
1 Closer	CO2051/CO2061
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop (@ Outswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Inswing Doors)	L02101 CONVEX
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

PROVIDE NON-HOLD-OPEN CLOSER AT TOILET ROOMS.

STONE THRESHOLD BY OTHER TRADES.

HW-4C

Each Door to Have:	NONRATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Hospital Utility Lock	F09 x PADDLES POINTING DOWN
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
1 Set Seals	R0Y164

HW-4D

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Classroom Lock	F05
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Mop Plate (@ Inswing Doors)	J103
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop (@ Outswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Inswing Doors)	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

HW-4E

Each Door to Have:	NON-RATED/RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Utility Lock	F09
1 Closer (@ rated doors)	C02011/C02021
1 Closer (@ non-rated doors)	CO2051/CO2061
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4F

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Utility Lock	F09
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop (@ Outswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Inswing Doors)	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

HW-4G

Each Door to Have:	RATED/NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Utility Lock	F09
1 Closer (@ Rated Doors)	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-4H

Each [MHO] Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Classroom Lock	F05
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Magnetic Holder	C00011 TRI-VOLTAGE
1 Set Self-Adhesive Seals	R0Y154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-4J

Each Door to Have:	RATED/NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Utility Lock	F09
1 Closer (@ Rated Doors)	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4K (WAITING)

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL
	X ADJUSTA-SCREWS
1 Utility Lock	F09
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-4L

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL
	X ADJUSTA-SCREWS
1 Classroom Lock	F05
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
1 Set Sound/Light Seals	R0Y264/R0Y255

HW-4M

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL
	X ADJUSTA-SCREWS
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Heavy-Duty Armor Plate	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-4N

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Utility Lock	F09
1 Closer (@ rated doors)	C02011/C02021
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4P

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4Q

Each Door to Have:	NON-RATED
1 Pivot Set	C07162 x 454KG (1000 LBS) WEIGHT CAPACITY
1 Intermediate Pivot	CO7311
1 Utility Hospital Lock	F09 x LEAD-LINED x PADDLES POINTING DOWN
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seal	R0Y154

HW-4R

Each [ADO] Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Classroom Lock	F05
1 Electric Strike	E09311 (FAIL-SECURE), 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103 @ TOILET ROOMS ONLY
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

AT TOILET ROOMS, OMIT METAL THRESHOLD; STONE THRESHOLD BY OTHER TRADES.
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.
OWER TRANSFER FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-4S

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Classroom Lock	F05
1 Heavy-Duty Armor Plate	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-4T

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seals	R0Y154

HW-4U

Each Door to Have:	NON-RATED/RATED
1 Continuous Hinge	-
1 Public Restroom Lock	F09
1 Closer	C02011/C02021
1 Closer	CO2051/CO2061
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop (@ Outswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Inswing Doors)	L02101 CONVEX
1 Set Self-Adhesive Seals	R0Y154

PROVIDE NON-HOLD-OPEN CLOSER AT TOILET ROOMS.

STONE THRESHOLD BY OTHER TRADES.

HW-4V

Each Lead-Lined Door to Have:	NON-RATED
1 Pivot Set	C07162 x 454KG (1000 LBS) WEIGHT CAPACITY
1 Intermediate Pivot	CO7311
1 Utility Hospital Lock	F09 x LEAD-LINED x PADDLES POINTING DOWN
1 Closer	CO2011/CO2021 x METAL LEAD-LINED COVER
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Holder-Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seal	R0Y154

HW-4X

Each [ADO] Lead-Lined Door to Have:	NON-RATED
1 Pivot Set	C07162 x 454KG (1000 LBS) WEIGHT CAPACITY
1 Intermediate Transfer Pivot	CO7311 x 4 WIRE TRANSFER
1 Utility Hospital Lock	F09 x LEAD-LINED x PADDLES POINTING DOWN
1 Electric Unlatch Strike	E09321
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seal	R0Y154

POWER TRANSFER PIVOT IS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTO DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13.

HW-4Y

Each [ADO] Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Utility Hospital Lock	F09 x PADDLES POINTING DOWN
1 Electric Unlatch Strike	E09321
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seals	R0Y154

POWER TRANSFER PIVOT IS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-5

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Kick Plate	J102 (@ STORAGE, EVM, & HAC ROOMS ONLY)
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-5A

THIS SET NOT USED.

HW-5B (STORAGE PYXIS)

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-5C

THIS SET NOT USED.

HW-5D (HAC)

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Kick Plate	J102 (@ STORAGE, EVM, & HAC ROOMS ONLY)
1 Floor Stop (@ Inswing Doors)	L02121 x 3 FASTENERS
1 Wall Stop (@ Outswing Doors)	L02101 CONVEX
3 Silencers	L03011

HW-5E

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
1 Armor Plate	J101 x 3.125 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-5F

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer (@ Rated Doors)	C02011/C02021
1 Heavy-Duty Armor Plate	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-5G

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-5H

Each Dutch Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Dutch Door Bolt	L04161-4” @ Top Leaf
1 Storeroom Lock	F07 @ Bottom Leaf
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS @ Bottom Leaf
1 Wall Stop	L02101 @ Bottom Leaf
1 Set Self-Adhesive Seals	R0Y154

HW-5J

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-5K

Each Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Storeroom Lock	F07
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-5L

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Security Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-6

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Exit Device	TYPE 1 F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-6A

Each Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X HOSPITAL TIP X ADJUSTA-SCREWS
1 Exit Device	TYPE 1 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154/R0Y155

HW-6B

Each [MHO] Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Exit Device	TYPE 1 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Magnetic Holder	C00011 TRI-VOLTAGE
1 Set Self-Adhesive Seals	R0Y154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-6C

Each Door to Have:	NON-RATED/RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Exit Device	TYPE 1 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	02021
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-6D

Each [ADO] Integrated Door to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-6E

Each Door to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Exit Device	TYPE 1 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Kick Plate	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-6F

Each [ADO] Door to Have:	NON-RATED/RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANELS
1 Elec. Exit Device	TYPE 1 F08 LEVER (E04)
1 Key Cylinder	TYPE AS REQUIRED
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

POWER TRANSFER **SHARED BY ELECTRIC PANIC AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTO DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13.

HW-6G

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Exit Device	TYPE 1 F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-7

Each Motorized Roll-up Door to Have:	NON-RATED
1 Key Cylinder (for keyswitch)	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 33 00, COILING DOORS AND GRILLES

HW-7A

Each Special Door to Have:	NON-RATED
1 Padlock	TYPE AS REQUIRED PER 08 71 00 2.27.

BALANCE OF HARDWARE BY DOOR MANUFACTURER.

HW-7B

Each RF Shielded Door to Have:	NON-RATED
1 Pivot Set	C07162 x 454KG (1000 LBS) WEIGHT CAPACITY
1 Intermediate Pivot	CO7311
1 Utility Hospital Lock	F09 x LEAD-LINED x PADDLES POINTING DOWN
1 Key Cylinder	TYPE AS REQUIRED
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Overhead Stop	C01541-ADJUSTABLE
1 Set Self-Adhesive Seal	R0Y154

D. **INTERIOR PAIRS OF DOORS**

HW-8

Each [MHO] Pair Integrated Doors to Have: RATED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-8A

Each Aluminum Storefront Pair to Have:	NON-RATED
2 Floor Closers	C06041
2 Intermediate Pivots	C07321
2 Push/Pull Bar Sets	J505 – 305 MM (12 INCH) CENTER-TO-CENTER PULL
2 Overhead Stops	C01541-ADJUSTABLE

HW-8B

Each Pair to Have:	NON-RATED
2 Continuous Hinge	-
2 Push Plate	J304 8” x 16”
2 Hospital Grip	J401
2 Kick Plate	J102
2 Mop Plate (@ Inswing Doors)	J103
2 Closer	C02011/C02021
2 Floor Stop	L02121 x 3 FASTENERS
2 Silencers	L03011

HW-8C

Each Double-Acting Pair to Have:	NON-RATED
2 Double-Acting Floor Closers	C06011
4 Push Plates	J304 8” x 16”
4 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
4 Edge Guard (@ Wood Doors)	J209P / J212 (VERIFY)
2 Overhead Holders	C01511-ADJUSTABLE

HW-8D (ENTRY WAITING)

Each [ADO] Aluminum Storefront Pair to Have:	NON-RATED
2 Pivot Sets	C07162
2 Intermediate Transfer Pivots	C07321 x 4-WIRES
2 Intermediate Pivots	C07321
2 Push/Pull Bar Sets	J505 – 305 MM (12 INCH) CENTER-TO-CENTER PULL
2 Overhead Stops	C01541-ADJUSTABLE

AUTO DOOR OPERATORS, CONTROLS, AND REACTIVATION SENSORS BY SECTION 08 71 13.11.

POWER TRANSFERS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

HW-8E

Each [ADO] Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFERS X IN-HINGE ACCESS PANEL
2 Push Plate	J304 8” x 16”
2 Hospital Grip	J401
2 Kick Plate	J102
2 Mop Plate (@ Inswing Doors)	J103
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stop	L02121 x 3 FASTENERS
2 Silencers	L03011

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFERS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-8F

Each [ADO] Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFERS X IN-HINGE ACCESS PANEL
2 Push Plate	J304 8" x 16"
2 Hospital Grip	J401
2 Kick Plate	J102
2 Mop Plate (@ Inswing Doors)	J103
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFERS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-9

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

HW-10

Each Pair to Have:	NONRATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW-10A

Each [ADO] Pair to Have:	NON-RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS X 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Electric Unlatch Strike	E09321 (FAIL SECURE)
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFER **SHARED BY ELECTRIC STRIKE AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-10B

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
1 Closers (@ rated doors)	C02011/C02021
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS

INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW-10C

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Utility Lock	F09
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Kick Plates	J102
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-10D

Each Pair to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Kick Plates	J102
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-10E

Each Lead Lined Pair to Have:	NON-RATED
2 Pivot Sets	C07162 x 454KG (1000 LBS) WEIGHT CAPACITY
2 Intermediate Pivots	CO7311
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT x LEAD-LINED
1 Classroom Lock	F05 x LEAD-LINED x PADDLES POINTING DOWN
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS X LEAD-LINED
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
4 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-10F

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW-10G

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
1 Lock Trim Protector Bar	R111LPB-630 (ROCKWOOD), OR EQUAL
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

INSTALL LOCK TRIM PROTECTOR BAR ON PUSH SIDE OF ACTIVE LEAF TO PROTECT LEVER TRIM.

HW-10H

Each [ADO] Lead-Lined Pair to Have:	RATED/NON-RATED
2 Bottom Pivots	C07162 LESS TOP PIVOT x 454KG (1000 LBS) WEIGHT CAPACITY
1 Intermediate Pivot	C07311 (MIDDLE OF ACTIVE LEAF)
1 Intermediate Transfer Pivot	CO7311 x 4 WIRE TRANSFER (MIDDLE OF INACTIVE LEAF)
2 Intermediate Transfer Pivot	CO7311 x 4 WIRE TRANSFER (NEAR TOP OF EACH LEAF)
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT X LEAD-LINED
1 Hospital Utility Lock	F09 x PADDLES POINTING DOWN X LEAD-LINED
1 Electric Unlatch Strike	E09321 (FAIL SECURE) (LEAD-LINED)
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS X LEAD-LINED
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
4 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Overhead Stops	C01541-ADJUSTABLE
1 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFER PIVOTS NEAR TOP OF EACH DOOR FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

HW-10J

Each [ADO] Pair to Have:	RATED/NON-RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Hospital Lock	F05 x PADDLES POINTING DOWN
1 Electric Unlatch Strike	E09321 (FAIL-SECURE)
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Overhead Stops	C01541-ADJUSTABLE
1 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFERS **SHARED BY ELECTRIC STRIKE AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

*AT WOOD PAIRS RATED 45-MINUTES OR MORE, PROVIDE ELECTRIC STRIKE 310-2-3/4 (FOLGER ADAM OR EQUAL) IN LIEU OF SPECIFIC UNLATCH STRIKE.

HW-10K

Each [ADO] Pair to Have:	RATED/NON-RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Electric Unlatch Strike	E09321 (FAIL-SECURE)
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

POWER TRANSFER **SHARED BY ELECTRIC STRIKE AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

*AT WOOD PAIRS RATED 45-MINUTES OR MORE, PROVIDE ELECTRIC STRIKE 310-2-3/4 (FOLGER ADAM OR EQUAL) IN LIEU OF SPECIFIC UNLATCH STRIKE.

HW-10L

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Classroom Lock	F05
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Heavy-Duty Armor Plates	J101 x 3.175 MM (0.125 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-10M

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Utility Lock	F09
1 Overlapping Astragal with	R0Y634 x R0Y154 x THRU-BOLTS Self-Adhesive Seal
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-11

Each Pair to Have:	RATED/NR
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Storeroom Lock	F07
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Kick Plates	J102 (@ STORAGE ROOMS ONLY)
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-11A

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25
1 Security Storeroom Lock	F13-MOD x RIGID OUTSIDE LEVER x KEY RETRACTS DEADBOLT AND LATCHBOLT
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Armor Plates	101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-11B

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25
1 Storeroom Lock	F07
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-11C (MECHANICAL)

Each Pair to Have:	RATED/NR
Hinges	QUANTITY & TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1 Storeroom Lock	F07
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS C02011/C02021
2 Kick Plates	J102 (@ STORAGE ROOMS ONLY)
2 Floor Stops	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Set Self-Adhesive Seals	R0Y154

HW-12

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Exit Device	TYPE 7 or 8 F01
1 Exit Device	TYPE 7 or 8 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R0Y834
2 Closers	C02011/C02021
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-12A

Each [MHO] Pair Integrated Doors to Have: RATED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-12B

Each [ADO] Pair Integrated Doors to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES
AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-12C

Each [MHO] Pair Integrated Double Egress Doors to Have: RAT

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-12D

Each [ADO] Pair Integrated Double Egress Doors to Have: RATED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES
AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-12E

Each Pair to Have:	RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X HOSPITAL TIP X ADJUSTA-SCREWS
1 Exit Device	TYPE 7 or 8 F01
1 Exit Device	TYPE 7 or 8 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R0Y834
2 Closers	C02011/C02021
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
2 Door Bottom	R0Y434 x NYLON BRUSH INSERT
2 Set Self-Adhesive Seals	R0Y154

HW-12F

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Exit Device	TYPE 7 or 8 F01
1 Exit Device	TYPE 7 or 8 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R0Y834
2 Closers	C02021
2 Floor Stops	L02121 x 3 FASTENERS
2 Door Bottom	R0Y434 x NYLON BRUSH INSERT
2 Sets Self-Adhesive Seals	R0Y154

HW-12G

Each Pair to Have:	NON-RATED
2 Continuous Hinges	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Exit Device	TYPE 7 or 8 F01
1 Exit Device	TYPE 7 or 8 F08 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R0Y834
2 Closers	C02051/C02071
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-12H

Each [ADO] Pair to Have:	NON-RATED
2 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Elec. Exit Device	TYPE 7 or 8 F01 (E04)
1 Elec. Exit Device	TYPE 7 or 8 F08 LEVER (E04)
1 Key Cylinder	TYPE AS REQUIRED
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Set Meeting Stile Astragals	R0Y834
2 Kick Plates	J102
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
2 Auto Door Bottoms	R0Y346 –HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

POWER TRANSFERS **SHARED BY ELECTRIC PANIC AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTO DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13.

HW-12J

Each Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Exit Device	TYPE 7 or 8 F01
1 Exit Device	TYPE 7 or 8 F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Set Meeting Stile Astragals	R0Y834
2 Closers	C02011/C02021
2 Floor Stops	L02121 x 3 FASTENERS
2 Auto Door Bottoms	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154

HW-13

Each [ADO] Bi-Parting Automatic Pair to Have: NON-RATED

ALL HARDWARE BY SECTION 08 71 13.

SECURITY HARDWARE ABBREVIATIONS LEGEND:
AC = Access Control Device (Card reader, biometric reader, keypad, etc.)
ADO = Automatic Door Operator
DEML = Delayed Egress Magnetic Lock
DEPH = Delayed Egress Panic Exit Device
DPS = Door Position Switch (Door or Alarm Contact)
EL = Electric Lock or Electric Lever Exit Device
PB = Push-button Combination Lock (stand-alone)
RR = Remote Release Button
ELR = Electric Latch Retraction Exit Device
REX = Request-to-Exit Switch in Latching Device Inside Trim

E. **INTERIOR SINGLE SECURITY DOORS**

HW-SH-1

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

HW-SH-2

Each Door to Have:	NON RATED
1 Continuous Hinge	
1 Door Pull w/ Plate	J401 x J302
1 Lock	DETENTION TYPE LOCK
1 Strike/Keeper	AS REQUIRED
1 Overhead Stop	C01541-ADJUSTABLE X SEC. TORX
1 Door Position Switch	

HW-SH-3

Each [AC, EL, REX, DPS] Door to Have:	RATED/NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge	4-WIRE TYPE AS REQUIRED
1 Electrified Lock	F07 (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
CARD READER BY DIVISION 28.

HW-SH-3A

THIS SET NOT USED.

HW-SH-3B

Each [PB] Door to Have:	RATED
1 Continuous Hinge	
1 Push-button Combination Lock	N3 – A156.13 F07 G1 E06
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Mop Plate (@ Inswing Doors)	J103
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-SH-3C (STORAGE CLOSET)

Each [PB] Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Push-button Combination Lock	N3 – A156.13 F07 G1 E06
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-SH-3D

Each [AC, EL, REX, DPS] Door to Have:	RATED
1 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS X 4-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Electrified Lock	F07 (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals	R0Y154
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

HW-SH-3E

Each [AC, EL, REX, DPS] Door to Have:		RATED
Hinges		QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge		4-WIRE TYPE AS REQUIRED
1 Electrified Occupancy	Indicator Lock	F13-MODIFIED (E01-REX, E06) 24VDC X OCCUPANCY INDICATOR X KEY RETRACTS LATCHBOLT AND DEADBOLT X INTERNAL DEADBOLT MONITOR SWITCH
1 Power Supply		REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer		C02011/C02021
1 Floor Stop		L02121 x 3 FASTENERS
1 Threshold		J32300 x 57 mm width (2-1/4 inches)
1 Auto Door Bottom		R0Y346 – HEAVY DUTY
2 Sets Self-Adhesive Seals		R0Y154
1 Alarm Contact		

INTERNAL DEADBOLT MONITOR SWITCH SHUNTS ACCESS CONTROL DEVICE WHEN DEADBOLT IS THROWN.
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
CARD READER BY DIVISION 28.

HW-SH-3F

Each [AC, RR, EL, REX, DPS] Door to Have:	RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Electrified Lock	F13-MOD x RIGID OUTSIDE LEVER X NO INSIDE TURN X KEY RETRACTS LATCHBOLT AND DEADBOLT (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
CARD READER BY DIVISION 28.

HW-SH-3G

Each [AC, RR, EL, REX, DPS] Door to Have:	RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Electrified Lock	F13-MOD x RIGID OUTSIDE LEVER X NO INSIDE TURN X KEY RETRACTS LATCHBOLT AND DEADBOLT (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Threshold	J32300 x 57 MM WIDTH (2-1/4 INCHES)
1 Auto Door Bottom	R0Y346 – HEAVY DUTY
1 Set Self-Adhesive Seals	R0Y154
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

HW-SH-3H

Each [AC, EL, REX, DPS] Door to Have:	NON-RATED/RATED
1 Continuous Transfer Hinge	x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Electrified Lock	F13-MOD x RIGID OUTSIDE LEVER X KEY RETRACTS LATCHBOLT AND DEADBOLT (E01- REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Closer	C02011/C02021
1 Kick Plate	J102
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
1 Door Viewer	L03221 – 190°
1 Alarm Contact	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
CARD READER BY DIVISION 28.

HW-SH-4 (BREAK)

Each [AC, EL, REX, DPS] Integrated Door to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-SH-4A

Each [ADO, AC, ELR, REX, DPS] Integrated Door to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-SH-4B

Each [ADO, AC, EL, REX, DPS] Door to Have:	RATED
1 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 12-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1 Electrified Exit Device	TYPE 1 (E01-REX, E06) F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
1 Power Supply	TYPE REQUIRED BY PANIC MANUFACTURER X ADO BOARD
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

POWER TRANSFER **SHARED BY ELECTRIC PANIC AND** RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).
AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-SH-5

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

HW-SH-6

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

F. **INTERIOR PAIRS OF SECURITY DOORS**

HW-SH-7

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

HW-SH-8

THIS HARDWARE SET LEFT INTENTIONALLY BLANK AT THIS TIME.

HW-SH-9

Each [AC, EL, REX, DPS] Pair to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
1 Transfer Hinge	4-WIRE TYPE AS REQUIRED
1 Set Auto Flush Bolts	TYPE 25
1 Dust Proof Strike	L04021
1 Electrified Lock	F07 (E01-REX, E06) 24VDC
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Kick Plates	J102 (@ STORAGE ROOMS ONLY)
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
2 Alarm Contacts	

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

HW-SH-9A

Each [PB] Pair to Have:	RATED
2 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1 Set Auto Flush Bolts	TYPE 25
1 Dust Proof Strike	L04021
1 Push-button Combination Lock	N3 – A156.13 F07 G1 E06
1 Coordinator	TYPE 21A
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Closers	C02011/C02021
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154

HW-SH-10

Each [AC, EL, REX, DPS] Pair Integrated Doors to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

HW-SH-10A (CORRIDORS)

Each [AC, ADO, EL, REX, DPS] Pair Integrated Doors to Have:	RATED
1 Key Cylinder	TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES. AUTOMATIC DOOR OPERATORS AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-MH6A

Each Pair to Have:	NON-RATED/RATED
2 Continuous Hinge	x INTEGRAL HINGE GUARD CHANNEL X HOSPITAL TIP X ADJUSTA-SCREWS
2 Manual Flush Bolts	L04251/L04261 (VERIFY)
1 Dust Proof Strike	L04021
1 Passage Latch	F01 x LESS TRIM
1 Set Anti-Ligature Trim	
1 Overlapping Astragal	R0Y634 x R0Y154 x THRU-BOLTS
2 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2 Floor Stop	L02121 x 3 FASTENERS
1 Set Seals	R0Y164

PROVIDE SECURITY FASTENERS FOR ALL HARDWARE ITEMS.

NO CLOSER REQUIRED DUE TO EXEMPTION FOR PATIENT ROOM DOORS.

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SECTION 08 71 13.11
LOW ENERGY POWER ASSIST DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Low-energy, power-assisted automatic swing door operators.

1.2 RELATED WORK

A. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES: Steel Doors.

B. Section 08 14 00, INTERIOR WOOD DOORS: Wood Doors.

C. Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS: Aluminum Frames Entrance Work.

D. Section 08 71 00, DOOR HARDWARE: Door Hardware.

E. Division 26, ELECTRICAL: Electric General Wiring, Connections and Equipment Requirements.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

B209-20.....Aluminum and Aluminum-Alloy Sheet and Plate.
B221-20.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

C. Builders Hardware Manufacturers Association, Inc. (BHMA):

156.19-20.....Power Assist and Low Energy Power Operated Doors.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting minimum 30 days before beginning Work of this section.

1. Required Participants:
   a. Contracting Officer's Representative.
   b. Contractor.
   c. Installer.
   d. Manufacturer's field representative.
   e. Other installers responsible for adjacent and intersecting work, including electrical wiring installers.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Maintenance manuals.
3. Installation instructions.
4. Warranty.

D. Certificates: Certify products comply with specifications.

1. Show door operator is UL Listed for specified application.

E. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.
2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.

B. Installer Qualifications:

1. Regularly installs specified products.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.9 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant automatic door operators against material and manufacturing defects.

1. Warranty Period: 2 years.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Power assisted automatic door equipment accommodating normal traffic as well as the weight of the doors; UL approved and comply with applicable codes.

2.2 SYSTEM PERFORMANCE

A. Opening Force: Maximum 67 N (15 pound force).

B. Cycle Tests: 300,000 cycles.

1. Use the widest and heaviest door specified as a test specimen. Narrower or lighter doors of the same configurations will be considered to meet the cycle test requirements.

2.3 MATERIALS

A. Aluminum:

1. Sheet: ASTM B209.
2. Extrusions: ASTM B221.

2.4 PRODUCTS - GENERAL

A. Provide automatic door operators from one manufacturer.

2.5 LOW-ENERGY AUTOMATIC DOOR OPERATORS

A. Conform to BHMA A156.19.

B. Mounting: Surface-mounted.

C. Enclosure: Self-contained within an extruded aluminum housing (alloy 6063-T6) to conceal operator mechanism and mounting brackets and with removable access cover with an overall maximum size of 140 mm (5-1/2 inches) wide by 150 mm (6 inches) deep.

D. Safety Features:

1. Adjustable time delay.
2. Adjustable speed for opening and closing operations.
3. Adjustable backcheck.
4. Decals indicating "In" or "Do Not Enter" installed on both faces of each door where shown conforming to the requirements of ANSI/BHMA A156.19.

5. Re-activation sensor mounted on the push-side door face near the top detect any person standing in the door swing path and prevent the door from closing.
6. Motion sensor to detect any person standing in the door swing path and prevent the door from opening.
   a. Adjustable door sensor system providing complete operation and safety zone coverage.

E. Power Units:
1. Self-contained electric circuits for automatic operators located on each floor of the building.
2. Interruption or failure of power circuits for operators located on one floor of the building shall not interfere with continuous performance of automatic operated doors located on other floors.
3. Power units designed to not interfere with continuous performance of automatic operated doors located on other floors in the case of power interruption or failure.
4. Capacity and size of power circuits according to automatic operator manufacturer's specifications.

2.6 OPERATION

A. Traffic Operation:
1. Single Door: One way.
2. Double Doors: Double egress.

B. Operator: Electromechanical; surface-mounted.
1. Operators to have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle.
2. Operators to recycle doors instantaneously to full open position from any point in closing cycle when control switch is reactivated.
3. Operators to allow manual door control in event of power failure.

C. Controls: Solid-state type.

D. Activation: Push-plate switch.

2.7 FINISHES

A. Aluminum Anodized Finish: NAAMM AMP 500.
1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.

3. Clear Anodized Finish: AA-C22A31; Class II Architectural, 0.01 mm (0.4 mil) thick.
4. Color Anodized Finish: AA-C22A32 or AA-C22A34; Class II Architectural, 0.01 mm (0.4 mil) thick.

B. Aluminum Paint finish:
1. Baked-Enamel or Powder-Coat: AAMA 2603; dry film thickness of 0.04 mm (1.5 mils).

2.8 ACCESSORIES

A. Signage: BHMA standard for operation and door type specified.
B. Guide Rails: Aluminum bar with anodized baked-enamel or powder-coat finish.
C. Fasteners: Corrosion-resistant, compatible with adjoining materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions effecting work, including door and frame preparation and electrical rough-ins.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Coordinate installation of equipment with other related work.
C. Mount manual controls and power disconnect switches recessed or semi-flush in partitions.
D. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment in finish work.
E. Install power units and controls in locations indicated.
1. Where units are to be mounted on walls, provide metal supports or shelves for the units.

3.3 ADJUSTING

A. All equipment, including time delay switches, to be accessible for maintenance and adjustment.
B. Adjust operators to function properly for the type o£ traffic (pedestrians) expected to pass through doors.

C. Adjust each door leaf of pairs of doors to open and close in synchronization.

D. On pairs of doors, adjust operators allowing either door to be opened manually without the other door opening.

3.4 DEMONSTRATION AND TRAINING

A. Instruct VA personnel in proper door operator operation and maintenance.

1. Trainer: Manufacturer approved instructor.

B. Submit training plan and trainer qualifications. See Section 01 91 00 - GENERAL COMMISSIONING REQUIREMENTS.

C. Acceptance Condition: After completing work, operate door operators 15 consecutive calendar days without breakdown.

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01-01-21

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatic operators for swinging doors.

1.2 RELATED WORK

A. Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS: Aluminum Frames Entrance Work.

B. Section 08 71 00, DOOR HARDWARE: Door Hardware.

C. Division 26, ELECTRICAL Electric General Wiring, Connections and Equipment Requirements.

D. Division 28, ELECTRONIC SAFETY AND SECURITY: Access Control Devices:.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

1. B209-20 - Aluminum and Aluminum-Alloy Sheet and Plate.
2. A1008/A1008M-20 - Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Baked Hardenable.

C. Builders Hardware Manufacturers Association (BHMA):

1. BHMA A156.10-17 - Power Operated Pedestrian Doors.

D. National Fire Protection Association (NFPA):

1. 101-24 - Life Safety Code.

E. Underwriters Laboratories (UL):

1. 325-21 - Standard for Doors, Drapery, Gate, Louver, and Window Operators and Systems.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.

2. Installation instructions.
3. Warranty.

D. Sustainable Construction Submittals:

1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.

E. Test reports: Certify each product complies with specifications.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer with project experience list.
2. Installer with project experience list.

G. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.
2. Start-up, maintenance, troubleshooting, emergency, and shut-down instructions for each operational product.

1.5 QUALITY ASSURANCE

A. Manufacturer’s Qualifications:

1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
   a. Provide contact names and addresses for completed projects when requested by Contracting Officer's Representative.

B. Installer’s Qualifications: Experienced installer, approved by the manufacturer.

1.6 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

B. Manufacturer's Warranty: Warrant automatic door operators against material and manufacturing defects.

1. Warranty Period: Two years.

PART 2 - PRODUCTS

2.1 SYSTEM PERFORMANCE

A. Comply with requirements of BHMA A156.10. Unless otherwise indicated on Drawings, provide operators that move doors from fully closed to fully opened position in five seconds maximum time interval, when speed adjustment is at maximum setting.

B. Equipment: Conforming to UL 325. Provide key operated power disconnect wall switch for each door installation.

C. Electrical Wiring, Connections and Equipment: Motors, starters, controls, associated devices, and interconnecting wiring required for installation. Equipment and wiring as specified in Division 26, ELECTRICAL.

2.2 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide door operators from one manufacturer.

C. Provide one type of operator throughout project.

D. Sustainable Construction Requirements:

1. Steel Recycled Content: 30 percent total recycled content, minimum.

2. Aluminum Recycled Content: 80 percent total recycled content, minimum.

2.3 SWING DOOR OPERATORS

A. General:

1. Type: Institutional type.
2. Size: As recommended by manufacturer for door weight and sizes.

B. Function:

1. Provide operators, enclosed in housing, permitting opening of door by energizing motor and stopped by electrically reducing Voltage and stalling motor against mechanical stop.
2. Door to close by means of spring energy, and closing force controlled by gear system and motor being used as dynamic brake without power, or controlled by hydraulic closer in electro-hydraulic operators.
3. Opening and Closing Speeds: Field adjustable.
4. Operators with checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle.
5. Operators capable of recycling doors instantaneously to full open position from any point in closing cycle when control switch is activated.
6. When automatic power is interrupted or shut-off, permit doors to easily open manually without damage to automatic operator system.

C. Connect hardware with drive arm attached to door with pin linkage rotating in a self-lubricating bearing. Prevent doors from pivoting on shaft of operator.

D. Operator Housing:

1. ASTM B209, Type 6063-T5 aluminum alloy, 112 mm (4-1/2 inches) wide by 140 mm (5.5 inches) high by 3.2 mm (0.125 inch) thick, aluminum extrusions with enclosed end caps for application to 100 mm (4 inches) and larger frame systems.

E. Power Operator:

1. Completely assembled and sealed unit including gear drive transmission, mechanical spring and bearings, located in aluminum case and filled with special lubricant for extreme temperature conditions. Rubber mounted units with provisions for easy maintenance and replacement, without removing door from pivots or frame.

F. Motors:

1. Provide with interlock to prevent operation when doors are electrically locked from opening.

G. Electrical Control:

1. Self-contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator.
2. Connecting Harnesses: Interlocking plugs.

H. Accessories:

1. Metal mounting supports, brackets and other accessories necessary for installation of operators at head of door frames.

I. Microprocessor Controls:

1. Multi-function microprocessor control providing adjustable hold open time (1-30 seconds) with fully adjustable opening speed, LED indications for sensor input signals and operator status and power assist close options. Control capable of receiving activation signals from any device with normally open dry contact output.
2. Hold doors held open by low Voltage applied to the continuous duty motor.
3. Controls:

a. Adjustable safety circuit that monitors door operation and stops opening direction of door if obstruction is sensed.
b. Recycle feature that reopens door if obstruction is sensed at any point during closing cycle.
c. Standard three position key switch with functions for ON, OFF, and HOLD OPEN, mounted on operator enclosure, door frame, or wall, as indicated on drawings.

2.4 SLIDING DOOR OPERATORS

2.5 SLIDING DOOR UNITS

2.6 POWER UNITS

A. Self-contained, electric operated and independent of door operator.
   1. Capacity and size of power circuits according to automatic door operator manufacturer's specifications and Division 26 - ELECTRICAL.

2.7 DOOR CONTROLS

A. Control Devices: BHMA A156.10; control opening and closing functions.
B. Open doors when control device is actuated; hold doors in open positions; then, close doors after a set time period, unless safety device or reactivated control interrupts operation.
C. Manual Controls:
   1. Push Plate Wall Switch: Recessed type, stainless steel push plate minimum 100 mm by 100 mm (4 inch by 4 inch), with 13 mm (1/2 inch) high letters "To Operate Door-Push" engraved on face of plate.
D. Motion Detector:
   1. Mounting: Surface or concealed.
   2. Detection Area: 1500 mm (60 inches) deep and 1500 mm (60 inches) across, plus or minus 150 mm (6 inches).
   3. Response Time: 25 milliseconds, maximum.
   4. Control Power: 24 Volt DC.
   5. Design units to be unaffected by cleaning material, solvents, dust, dirt and outdoor weather conditions.

2.8 SAFETY DEVICES

A. Sliding Doors:
   1. Two photoelectric beams mounted at heights of 600 mm (24 inches) and 1200 mm (48 inches) in door frame.
   2. Overhead safety presence sensors at door head on both sides of opening.

3. Recycle doors to full open position when beams are interrupted.
4. Motion detector mounted on both sides of door for detection of traffic in both directions.

B. Swing Doors: Install presence sensor on pull side of door to detect any person standing in door swing path and prevent door from opening.
1. Time delay Switches: Adjustable between 3 to 60 seconds and control closing cycle of doors.

C. Install decal signs with "In" or "Do Not Enter" on both faces of each door where shown.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
1. Verify door opening is correctly sized and within acceptable tolerances.

B. Protect existing construction and completed work from damage.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.
1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

B. Coordinate door installation with other related work.

C. Install manual controls and power disconnect switches recessed or semi-flush mounted in partitions.

D. Secure operator components to adjacent construction with suitable fastenings.

E. Conceal conduits, piping, and electric equipment, in finish work.

F. Install power units in locations shown.
1. Where units are mounted on walls, provide metal supports or shelves for units.
2. Ensure equipment, including time delay switches, are accessible for maintenance and adjustment.

G. Ensure operators are adjusted and function properly for type of expected traffic.

H. Synchronize each leaf of pair doors to open and close simultaneously. Permit each door leaf to be opened manually, independent of other door leaf.

I. Install controls at positions shown and ensuring convenience for expected traffic.

J. Push Plate Wall Switches Mounting Height: 1000 mm (40 inches) maximum, unless otherwise approved by Contracting Officer's Representative.

3.3 DEMONSTRATION AND TRAINING

A. Instruct VA personnel in proper automatic door operator operation and maintenance.

1. Trainer: Manufacturer approved instructor.
2. Training Time: 2 hours minimum.

B. Coordinate instruction to VA personnel with VA Contracting Officer's Representative.

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01-01-21

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies the following:
   1. Glass.
   2. Glazing materials and accessories for both factory and field glazed assemblies.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE DESIGN REQUIREMENTS: Sustainable Design Requirements.
B. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS: Sound resistant doors.
C. Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES: Mirrors.
D. Section 08 51 13, ALUMINUM WINDOWS: Aluminum Windows.
E. Section 26 05 19, LOW VOLTAGE ELECTRICAL POWER AND CONDUCTORS AND CABLES: Wiring (120 V AC, 15A or 20A).
F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Junction and Switch Boxes.
G. Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS: Access Control Systems.

1.3 LABELS

A. Temporary labels:
   1. Provide temporary label on each light of glass identifying manufacturer or brand and glass type, quality and nominal thickness.
   2. Label in accordance with NFRC label requirements.
   3. Temporary labels are to remain intact until glass is approved by Contracting Officer Representative (COR).
B. Permanent labels:
   1. Locate in corner for each pane.
   2. Label in accordance with ANSI Z97.1 and SGCC label requirements.
      a. Tempered glass.
      b. Laminated glass or have certificate for panes without permanent label.
      c. Organic coated glass.

3. Fire rated glazing assemblies: Mark in accordance with IBC.

1.4 PERFORMANCE REQUIREMENTS

A. General: Design glazing system consistent with guidance and practices presented in the GANA Glazing Manual, GANA Laminated Glazing Manual, and GANA Sealant Manual, as applicable to project. Installed glazing is to withstand applied loads, thermal stresses, thermal movements, building movements, permitted tolerances, and combinations of these conditions without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; unsafe engagement of the framing system; deflections beyond specified limits; or other defects in construction.

B. Glazing Unit Design: Design glass, including engineering analysis meeting requirements of authorities having jurisdiction. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1. Design glass in accordance with ASTM E1300, and for conditions beyond the scope of ASTM E1300, by a properly substantiated structural analysis.

1.5 SUBMITTALS

A. 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. Manufacturer's Certificates:

1. Certificate stating that fire-protection and fire-resistive glazing units meet code requirements for fire-resistance-rated assembly and applicable safety glazing requirements.
2. Certificate on solar heat gain coefficient when value is specified.
3. Certificate on "R" value when value is specified.
4. Certificate test reports confirming compliance with specified bullet resistive rating.

5. Certificate that blast resistant glass meets the specified requirements.

D. Manufacturer Warranty.

E. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Insulating glass units.
3. Transparent (one-way vision glass) mirrors.
4. Elastic compound for metal sash glazing.
5. Putty, for wood sash glazing.
6. Glazing cushion.
7. Sealing compound.
8. Bullet resistive material.
9. Plastic glazing material, each type required.

F. Samples:

1. Size: 305 mm by 305 mm (12 inches by 12 inches).
2. Tinted glass.
3. Reflective glass.
4. Transparent (one-way vision glass) mirrors.

G. Preconstruction Adhesion and Compatibility Test Report: Submit glazing sealant manufacturer’s test report indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.

B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.

C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.

D. Protect laminated security glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location. Provide protective covering on exposed faces of

glazing plastics, and mark inside as "INTERIOR FACE" or "PROTECTED FACE":

1. Treat security glazing as fragile merchandise, and packaged and shipped in export wood cases with width end in upright position and blocked together in a mass. Storage and handling to comply with manufacturer's directions and as required to prevent edge damage or other damage to glazing resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, other environmental conditions, and contact with chemical solvents.
2. Protect sealed-air-space insulating glazing units from exposure to abnormal pressure changes, as could result from substantial changes in altitude during delivery by air freight. Provide temporary breather tubes which do not nullify applicable warranties on hermetic seals.
3. Temporary protections: The glass front and polycarbonate back of glazing are to be temporarily protected with compatible, peelable, heat-resistant film which will be peeled for inspections and re-applied and finally removed after doors and windows are installed at destination. Since many adhesives will attack polycarbonate, the film used on exposed polycarbonate surfaces is to be approved and applied by manufacturer.
4. Edge protection: To cushion and protect glass clad, and polycarbonate edges from contamination or foreign matter, the four (4) edges are to be sealed the depth of glazing with continuous standard-thickness thermoplastic rubber tape. Alternatively, continuous channel shaped extrusion of thermoplastic rubber are to be used, with flanges extending into face sides of glazing.
5. Protect "Constant Temperature" units including every unit where glass sheet is directly laminated to or directly sealed with metal-tube type spacer bar to polycarbonate sheet, from exposures to ambient temperatures outside the range of 16 to 24 degrees C (60 to 75 degrees F), during the fabricating, handling, shipping, storing, installation, and subsequent protection of glazing.

1.7 PROJECT CONDITIONS:

A. Field Measurements: Field measure openings before ordering tempered glass products to assure for proper fit of field measured products.

1.8 WARRANTY

A. Construction Warranty: Comply with the FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their glazing from the date of installation and final acceptance by the Government as follows. Submit manufacturer warranty.

1. Laminated glass units to remain laminated for five (5) years.

1.9 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 Architectural Manufacturers Association (AAMA):

800.....Test Methods for Sealants

810.1-16.....Expanded Cellular Glazing Tape

C. American National Standards Institute (ANSI):

Z97.1-R20.....Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test

D. American Society of Civil Engineers (ASCE):

7-22.....Wind Load Provisions

E. ASTM International (ASTM):

C542-05(2017).....Lock-Strip Gaskets

C716-06(2015).....Installing Lock-Strip Gaskets and Infill Glazing Materials

C794-22.....Adhesion-in-Peel of Elastomeric Joint Sealants

C864-05(2019).....Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C920-18.....Elastomeric Joint Sealants

C964-20.....Standard Guide for Lock-Strip Gasket Glazing

C1036-21.....Flat Glass

C1048-18.....Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

C1172-19.....Laminated Architectural Flat Glass

C1349-17.....Standard Specification for Architectural Flat Glass Clad Polycarbonate

C1376-21a.....Pyrolytic and Vacuum Deposition Coatings on Flat Glass

D635-22.....Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position

D4802-16.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

E84-21.....Surface Burning Characteristics of Building Materials

E119-22.....Standard Test Methods for Fire Test of Building Construction and Material

E1300-24.....Load Resistance of Glass in Buildings

E1886-19.....Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials

E1996-23.....Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes

E2141-21.....Test Methods for Assessing the Durability of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2190-19.....Insulating Glass Unit

E2240-06.....Test Method for Assessing the Current-Voltage Cycling Stability at 90 Degree C (194 Degree F) of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2241-06.....Test Method for Assessing the Current-Voltage Cycling Stability at Room Temperature of Absorptive Electrochromic Coatings on Sealed Insulating Glass Units

E2354-10.....Assessing the Durability of Absorptive Electrochromic Coatings within Sealed Insulating Glass Units

E2355-10.....Test Method for Measuring the Visible Light Transmission Uniformity of an Absorptive Electrochromic Coating on a Glazing Surface

F1233-21.....Standard Test Method for Security Glazing Materials and Systems

F1642/F1642M-17.....Test Method for Glazing and Glazing Systems Subject to Airblast Loadings

F. Code of Federal Regulations (CFR):

16 CFR 1201-16.....Safety Standard for Architectural Glazing Materials

G. Glass Association of North America (GANA):

2022 Edition.....GANA Glazing Manual

2008 Edition.....GANA Sealant Manual

2009 Edition.....GANA Laminated Glazing Reference Manual

2010 Edition.....GANA Protective Glazing Reference Manual

H. International Code Council (ICC):

IBC.....International Building Code

I. Insulating Glass Certification Council (IGCC)

J. Insulating Glass Manufacturer Alliance (IGMA):

TB-3001-01.....Guidelines for Sloped Glazing

TM-3000.....North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use

K. Intertek Testing Services – Warnock Hersey (ITS-WHI)

L. National Fire Protection Association (NFPA):

80-22.....Fire Doors and Windows

252-22.....Fire Tests of Door Assemblies

257-22.....Standard on Fire Test for Window and Glass Block Assemblies

M. National Fenestration Rating Council (NFRC)

N. Safety Glazing Certification Council (SGCC) 2012:

Certified Products Directory (Issued Semi-Annually).

O. Underwriters Laboratories, Inc. (UL):

9-08(R2009).....Fire Tests of Window Assemblies

263-22.....Fire Tests of Building Construction and Materials

752-23.....Bullet-Resisting Equipment.

P. Department of Veterans Affairs:

Q. Architectural Design Manual for VA Facilities (VASDM)

S. Environmental Protection Agency (EPA):

40 CFR 59-23.....National Volatile Organic Compound Emission Standards for Consumer and Commercial Products

PART 2 - PRODUCT

2.1 GLASS

A. Provide minimum thickness stated and as additionally required to meet performance requirements.

1. Provide minimum 6 mm (1/4 inch) thick glass units unless otherwise indicated.

B. Obtain glass units from single source from single manufacturer for each glass type.

2.2 HEAT-TREATED GLASS

A. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 COATED GLASS

2.4 ELECTROCHROMIC COATED GLASS (not used)

2.5 PLASTIC GLAZING (not used)

2.6 LAMINATED GLASS

2.7 SECURITY GLAZING ASSEMBLY

2.8 INSULATING GLASS UNITS

2.9 FIRE PROTECTION AND FIRE RESISTANCE GLAZING

A. Fire-Protection-Rated Glazing: Glazing units tested for use in fire door assemblies or fire windows, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC, for fire-protection

ratings as indicated on construction documents, based upon positive-pressure testing per NFPA 257 or UL 9, and complying with NFPA 80.

1. Hose-Stream Test: Units must comply, except units having fire-protection rating of 20 minutes.

2. Temperature Rise Limitation: Units over 0.065 square meter (100 square inch) must comply with 232 deg. C (450 degress F) limitation.
3. Labeling: Permanently label fire-protection-rated glazing units in accordance with IBC.
4. Safety Glazing: Comply with 16 CFR 1201, Category II.

5. Fire-Protection-Rated Tempered Glass: For 20-minute fire-protection-rated door assemblies, of thickness scheduled.

6. Fire-Protection-Rated Laminated Ceramic Glazing: Units made from two lites of clear, ceramic glass, 8 mm (5/16 inch) total thickness, for rating scheduled.

7. Fire-Protection-Rated Laminated Glass with Intumescent Interlayers: Units made from multiple lites of uncoated, ultra-clear (low-iron) float glass, in intumescent interlayers, of thickness and rating scheduled.

B. Fire-Resistance-Rated Glazing: Glazing units tested for use in fire wall assemblies, UL, ITS-WHI or equivalent listed and labeled by testing agency in accordance with IBC for fire-resistance ratings of wall assemblies as indicated on construction documents, based upon testing according to NFPA 252 and ASTM E119 or UL 263.
   1. Labeling: Permanently label fire-resistance-rated glazing units in accordance with IBC.
   2. Safety Glazing: Comply with 16 CFR 1201, Category II.

2.10 SWITCHABLE PRIVACY GLASS

2.11 INSULATING PLASTIC SHEETS

2.12 GLAZING ACCESSORIES

A. As required to supplement the accessories provided with the items to be glazed and to provide a complete installation. Ferrous metal

accessories exposed in the finished work are to have a finish that will not corrode or stain while in service. Fire rated glazing to be installed with glazing accessories in accordance with the manufacturer's installation instructions.

B. Setting Blocks: ASTM C864:
   1. Silicone type.
   2. Channel shape; having 6 mm (1/4 inch) internal depth.
   3. Shore A hardness of 80 to 90 Durometer.
   4. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
   5. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
   6. Block thickness: Minimum 4.8 mm (3/16 inch). Thickness sized for rabbet depth as required.

C. Spacers: ASTM C864:
   1. Channel shape having a 6 mm (1/4 inch) internal depth.
   2. Flanges not less 2.4 mm (3/32 inch) thick and web 3 mm (1/8 inch) thick.
   3. Lengths: 25 to 76 mm (1 to 3 inches).
   4. Shore A hardness of 40 to 50 Durometer.

D. Glazing Tapes:
   1. Semi-solid polymeric based closed cell material exhibiting pressure-sensitive adhesion and withstanding exposure to sunlight, moisture, heat, cold, and aging.
   2. Shape, size and degree of softness and strength suitable for use in glazing application to prevent water infiltration.
   3. Complying with AAMA 800 for the following types:
      a. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
      b. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

E. Spring Steel Spacer: Galvanized steel wire or strip designed to position glazing in channel or rabbeted sash with stops.

F. Glazing Clips: Galvanized steel spring wire designed to hold glass in position in rabbeted sash without stops.

G. Glazing Points (Sprigs): Pure zinc stock, thin, flat, triangular or diamond shaped pieces, 6 mm (1/4 inch) minimum size.

H. Glazing Gaskets: ASTM C864:
   1. Firm dense wedge shape for locking in sash.
   2. Soft, closed cell with locking key for sash key.
   3. Flanges may terminate above the glazing-beads or terminate flush with top of beads.

I. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.

J. Glazing Sealants: ASTM C920, silicone neutral cure:
   1. Type S.
   2. Class 25 or 50 as recommended by manufacturer for application.
   3. Grade NS.
   4. Shore A hardness of 25 to 30 Durometer.
   5. VOC Content: For sealants used inside the weatherproofing system, not more than 250 g/L or less when calculating according to 40 CFR 59, (EPA Method 24).

K. Neoprene, EPDM, or Vinyl Glazing Gasket: ASTM C864.
   1. Channel shape; flanges may terminate above the glazing channel or flush with the top of the channel.
   2. Designed for dry glazing.

L. Color:
   1. Color of glazing compounds, gaskets, and sealants used for aluminum color frames to match color of the finished aluminum and be nonstaining.
   2. Color of other glazing compounds, gaskets, and sealants which will be exposed in the finished work and unpainted are to be black, gray, or neutral color.

M. Smoke Removal Unit Targets: Adhesive targets affixed to glass to identify glass units intended for removal for smoke control. Comply with requirements of local Fire Department.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:
   1. Examine openings for glass and glazing units; determine they are proper size; plumb; square; and level before installation is started.
   2. Verify that glazing openings conform with details, dimensions and tolerances indicated on manufacturer is approved shop drawings.

B. Review for conditions which may adversely affect glass and glazing unit installation, prior to commencement of installation. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units.

3.2 PREPARATION

A. For sealant glazing, prepare glazing surfaces in accordance with GANA Sealant Manual.

B. Determine glazing unit size and edge clearances by measuring the actual unit to receive the glazing.

C. Shop fabricate and cut glass with smooth, straight edges of full size required by openings to provide GANA recommended edge clearances.

D. Verify that components used are compatible.

E. Clean and dry glazing surfaces.

F. Prime surfaces scheduled to receive sealants, as determined by preconstruction sealant-substrate testing.

3.3 INSTALLATION – GENERAL

A. Install in accordance with GANA Glazing Manual, GANA Sealant Manual, IGMA TB-3001, and IGMA TM-3000 unless specified otherwise.

B. Glaze in accordance with recommendations of glazing and framing manufacturers, and as required to meet the Performance Test Requirements specified in other applicable sections of specifications.

C. Set glazing without bending, twisting, or forcing of units.

D. Do not allow glass to rest on or contact any framing member.

E. Glaze doors and operable sash, in a securely fixed or closed and locked position, until sealant, glazing compound, or putty has thoroughly set.

F. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.

G. Transparent (One-Way Vision Glass) Mirror: Use continuous channel glazing gasket.

H. Plastic:

1. Use dry glazing method.
2. Use only neoprene or EPDM gaskets.

I. Fire Protective and Fire Resistance Glass:

1. Wire Glass: Glaze in accordance with NFPA 80.
2. Other fire protective and fire resistant glass: Glaze in accordance with manufacturer's installation instructions and NFPA 80.
3. Due care is to be exercised (paint formula, ventilation, protection of polycarbonate) when painting becomes necessary to interiors of rooms of hardline glazed units; exposure to chemical solvents could result in irreparable damage to security glazings (delaminations, distortions, cracks, severe stress crazing, air bubbles, etc.).

3.4 INSTALLATION – ELECTROCHROMIC GLAZING

3.5 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

A. Cut glazing tape to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.

B. Place setting blocks at 1/4 points with edge block no more than 150 mm (6 inches) from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

D. Install removable stops without displacing glazing spline. Exert pressure for full continuous contact.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Trim protruding tape edge.

3.6 INSTALLATION - WET/DRY METHOD (PREFORMED TAPE AND SEALANT)

A. Cut glazing tape to length and set against permanent stops, 5 mm (3/16 inch) below sight line. Seal corners by butting tape and dabbing with butyl sealant.

B. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete the continuity of the air and vapor seal.

C. Place setting blocks at 1/4 points with edge block no more than 152 mm (6 inches) from corners.

D. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to achieve full contact at perimeter of pane or glass unit.

E. Install removable stops, with spacer strips inserted between glazing and applied stops, 6 mm (1/4 inch) below sight line. Place glazing tape on glazing pane or unit with tape flush with sight line.

F. Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, but not more than 9 mm (3/8 inch) below sight line. Sealant type is to be compatible with glazing tape.

G. Apply cap bead of sealant along void between the stop and the glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.7 INSTALLATION - WET METHOD (SEALANT AND SEALANT)

3.8 INSTALLATION - EXTERIOR BUTT GLAZED METHOD (SEALANT ONLY)

3.9 INSTALLATION - INTERIOR WET/DRY METHOD (TAPE AND SEALANT)

A. Cut glazing tape to length and install against permanent stops, projecting 1.6 mm (1/16 inch) above sight line.

B. Place setting blocks at 1/3 points with edge block no more than 150 mm (6 inches) from corners.

C. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.

D. Install removable stops, spacer shims inserted between glazing and applied stops at 600 mm (24 inch) intervals, 6 mm (1/4 inch) below sight line.

E. Fill gaps between pane and applied stop with sealant to depth equal to bite on glazing, to uniform and level line. Sealant type is to be compatible with glazing tape.

F. Trim protruding tape edge.

3.10 INSTALLATION - INTERIOR WET METHOD (COMPOUND AND COMPOUND)

3.11 INSTALLATION - REGLAZING HISTORIC FRAMING

3.12 COMMISSIONING – ELECTROCHROMIC GLAZING

3.13 REPLACEMENT AND CLEANING

A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by COR.

B. Replace cracked, broken, and imperfect glass, or glass which has been installed improperly.

C. Leave glass, putty, and other setting material in clean, whole, and acceptable condition.

3.14 PROTECTION

A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.15 MONOLITHIC GLASS SCHEDULE

A. Glass Type MG-1 : Clear fully tempered float glass.
   1. Unit Thickness: 6 mm (0.23 inch).
   2. Safety glazing label required.

3.16 LAMINATED GLASS SCHEDULE

3.17 INSULATING GLASS SCHEDULE

3.18 INSULATING LAMINATED GLASS SCHEDULE (FORCE PROTECTION AND PHYSICAL SAFETY)

3.19 ELECTROCHROMIC LAMINATED INSULATING GLASS SCHEDULE

3.20 FIRE-PROTECTIVE AND FIRE-RESISTANCE GLAZING SCHEDULE

A. Glass Type FR#1: Fire-protection-rated tempered glass.
   1. Thickness: 6 mm (0.23 inch)
   2. Rating: 20 minutes.
   3. Application: Fire-protection-rated door assemblies with openings not over 0.65 square meter (100 square inch).

3.21 SECURITY GLAZING SCHEDULE (not used)

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SECTION 08 90 00
LOUVERS AND VENTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies fixed and operable wall louvers, door louvers and wall vents.

1.2 RELATED WORK

A. Section 08 11 13, HOLLOW METAL DOORS AND FRAMES: Louvers in Steel Doors.

1.3 SUBMITTALS

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

B. Shop Drawings:

1. Each type, showing material, finish, size of members, method of assembly, and installation and anchorage details.

C. Manufacturer's Literature and Data:

1. Each type of louver and vent.

D. Color samples.

1.4 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. The Master Painters Institute (MPI):
Approved Product List – Updated Monthly

C. ASTM International (ASTM):

A240/A240M-23.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A653/A653M-23.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process

A1008/A1008M-24.....Steel, Sheet, Carbon, Cold Rolled, Structural, and High Strength Low-Alloy with Improved Formability

B209-23.....Aluminum and Aluminum Alloy, Sheet and Plate

B209M-23.....Aluminum and Aluminum Alloy, Sheet and Plate (Metric)

B221-21.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-21.....Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

D1187/D1187M-97(R2024)..Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

E. National Fire Protection Association (NFPA):

90A-24.....Installation of Air Conditioning and Ventilating Systems

F. American Architectural Manufacturers Association (AAMA):

2605-22.....High Performance Organic Coatings on Architectural Extrusions and Panels

G. Air Movement and Control Association, Inc. (AMCA):

500-L-23 Testing Louvers

PART 2 - PRODUCTS

2.1 MATERIALS:

A. Aluminum, Extruded: ASTM B221M (B221).

B. Stainless Steel: ASTM A240/A240M, Type 302B.

C. Galvanized Steel Sheet: ASTM A653/A653M; G90 min.

D. Carbon Steel and Sheet: ASTM A1008/A1008M (interior use louvers only).

E. Aluminum, Plate and Sheet: ASTM B209M (B209); alloy 3003 or 5005 with temper as required for forming.

F. Fasteners: Fasteners for securing louvers and wall vents to adjoining construction, except as otherwise specified or indicated in construction documents, to be toggle or expansion bolts of size and type as required for each specific type of installation and service condition.

1. Where type, size, or spacing of fasteners is not shown or specified, submit shop drawings showing proposed fasteners, and method of installation.

2. Fasteners for louvers, louver frames, and wire guards to be of stainless steel or aluminum with same finish as louvers.
3. Fasteners for louvers, louver frames and wire guards within mental health areas to be non-removable/tamper-proof type.

G. Inorganic Zinc Primer: MPI No. 19.

H. Bituminous Coating: ASTM D1187/D1187M; cold applied asphalt mastic emulsion.

2.2 EXTERIOR WALL LOUVERS: N/A

2.3 CLOSURE ANGLES AND CLOSURE PLATES:

A. Fabricate from 2 mm (0.078-inch) thick stainless steel or aluminum.

B. Provide continuous closure angles and closure plates on inside head, jambs and sill of exterior wall louvers.

C. Secure angles and plates to louver frames with screws, and to masonry or concrete with fasteners as indicated in construction documents.

2.4 WIRE GUARDS:

A. Provide wire guards on outside of all exterior louvers, except on exhaust air louvers.

B. Fabricate frames from 2 mm (0.078-inch) thick extruded or sheet aluminum designed to retain wire mesh.

C. Wire mesh to be woven from not less than 1.6 mm (0.063-inch) diameter aluminum wire in 13 mm (1/2-inch) square mesh.

D. Miter corners and join by concealed corner clips or locks extending not less than 57 mm (2-1/4 inches) into rails and stiles. Equip wire guards over 1219 mm (4 feet) in height with a mid-rail constructed as specified for frame components.

E. Fasten frames to outside of louvers with aluminum or stainless steel devices of same finish as louvers designed to allow removal and replacement without damage to the wire guard or the louver.

2.5 BLANK-OFF PANELS:

A. Uninsulated panels attached with clips or screws as follows: Panel finish is to be same finish applied to louvers.

1. Aluminum sheet for aluminum louvers, 1.27 mm (0.050 inch) minimum thickness.
2. Galvanized-steel sheet for galvanized-steel louvers, 1.02 mm (0.040 inch) minimum.

3. Stainless-steel sheet for stainless-steel louvers, not less than 0.95 mm (0.038 inch) minimum.

B. Insulated laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver with clips on screws and gasketed or sealant sealed perimeter. Panel finish is to be same finish applied to louvers.

1. Thickness: 25 mm (1 inch) 50 mm (2 inches) .
2. Aluminum sheet for aluminum louver 0.81 mm (0.032 inch) minimum.
3. Galvanized-steel sheet for galvanized-steel louver 0.71 mm (0.028 inch) minimum.
4. Stainless-steel sheet for stainless-steel louvers 0.79 mm (0.031 inch) minimum.
5. Insulating Core: extruded-polystyrene foam.

2.6 EXTERIOR DOOR LOUVERS:

2.7 INTERIOR DOOR LOUVERS:

A. Fabricate louvers for interior doors 0.063-inch thick extruded aluminum.

B. Make louvers sight-proof type with stationary blades,.

2.8 WALL VENTS:

2.9 AIR INTAKE VENTS:

A. Fabricate exterior louvered wall ventilators for fresh air intake for air conditioning units from extruded aluminum, ASTM B221M (B221). Form with integral horizontal louvers and frame, with drip extending beyond face of wall and integral water stops.

B. Provide aluminum closures where shown for inside face of dummy vents.

C. Provide 0.8 mm (0.032-inch) thick aluminum sleeves in cavity walls .

2.10 BRICK VENTS:

2.11 FINISH:

A. In accordance with NAAMM Metal Finishes Manual: AMP 500-505

B. Aluminum Louvers Air Intake Vents:

1. Manufacturer finished louvers are to have color as indicated in drawings to match existing.

2.12 PROTECTION:

A. Provide protection for aluminum against galvanic action wherever dissimilar materials are in contact, by painting the contact surfaces of the dissimilar material with a heavy coat of bituminous coating

(complete coverage), or by separating the contact surfaces with a performed synthetic rubber tape having pressure sensitive adhesive coating on one side.

B. Isolate the aluminum from plaster, concrete and masonry by coating aluminum with zinc-chromate primer.

C. Protect finished surfaces from damage during fabrication, erection, and after completion of the work. Strippable plastic coating on colored anodized finish is not approved.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Set work accurately, in alignment and where indicated in construction documents. Install plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

B. Furnish setting drawings and instructions for installation of anchors and for the positioning of items having anchors to be built into masonry construction. Provide temporary bracing for such items until masonry is set.

C. Provide anchoring devices and fasteners as shown and as necessary for securing louvers and vents to building construction as specified. Power actuated drive pins may be used, except for removal items and where members would be deformed or substrate damaged by their use.

3.2 CLEANING AND ADJUSTING:

A. After installation, all exposed prefinished and plated items and all items fabricated from stainless steel and aluminum are to be cleaned as recommended by the manufacturer and protected from damage until completion of the project.

B. All movable parts, including hardware, are to be cleaned and adjusted to operate as designed without binding or deformation of the members, so as to be centered in the opening of frame, and where applicable, to have all contact surfaces fit tight and even without forcing or warping the components.

C. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Contracting Officer Representative (COR) damaged units and replace with new units.

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DIVISION 09
FINISHES

SECTION 09 05 16
SUBSURFACE PREPARATION FOR FLOOR FINISHES

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies subsurface preparation requirements for areas to

B. receive the installation of applied and resinous flooring. This section includes removal of existing floor coverings, testing concrete for moisture and pH, remedial floor coating for concrete floor slabs having unsatisfactory moisture or pH conditions, floor leveling and repair as required.

1.2 RELATED WORK

A. Section 07 92 00, JOINT SEALANTS.

B. Section 09 65 16, RESILIENT SHEET FLOORING Section 09 65 19, RESILIENT TILE FLOORING Section 09 67 23.20, RESINOUS EPOXY BASE WITH VINYL CHIP BROADCAST (RES-2) Section 09 68 00, CARPETING

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA and TEST DATA.

B. Written approval confirming product compatibility with subfloor material manufacturer and the flooring manufacturer

C. Product Data:

1. Moisture remediation system
2. Underlayment Primer
3. Cementitious Self-Leveling Underlayment
4. Cementitious Trowel-Applied Underlayment (Not suitable for resinous floor finishes)

D. Test Data:

1. Moisture test and pH results performed by a qualified independent testing agency or warranty holding manufacturer’s technical representative.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. ASTM International(ASTM):

D638-22.....Standard Test Method for Tensile Properties of Plastics

D4259-18(2019).....Standard Practice for Preparation of Concrete by Abrasion Prior to Coating Application.

C109/C109M-20b(2020)....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens

7234-21.....Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers

E96/E96M-16(2016).....Standard Test Methods for Water Vapor Transmission of Materials

F710-21.....Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

F1869-23.....Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170-19a(2020).....Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

C348-18.....Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

C191-19(2020).....Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle

PART 2 - PRODUCTS

2.1 MOISTURE REMEDIATION COATING

A. System Descriptions:

1. High-solids, epoxy system designed to suppress excess moisture in concrete prior to an overlayment. For use under resinous products,

VCT, tile and carpet where issues caused by moisture vapor are a concern.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers and installation method. Verify compatibility with substrate. Use manufacturer's standard components, compatible with each other and as follows:

1. Liquid applied coating:
   a. Resin: epoxy.
   b. Formulation Description: Multiple component high solids.
   c. Application: Per manufacturer's written installation requirements.
   d. Thickness: minimum 10 mils

D. Material Vapor Permeance: Application shall achieve a permeance rating of less than 0.1 perm in accordance with ASTM E96/E96M.

E. Maximum RH requirement: 100% testing in accordance with ASTM F2170.

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	SCAMD Rule 1113 (Ammended 02/05/2016)	25 grams per liter
Permeance	ASTM E96	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufacture's Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

2.2 CEMENTITIOUS SELF-LEVELING UNDERLAYMENT

A. System Descriptions:
   1. High performance self-leveling underlayment resurfacer. Single component, self-leveling, cementitious material designed for easy application as an underlayment for all types of flooring materials. It is used for substrate repair and leveling.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up. Gypsum-based products are unacceptable.

C. System Characteristics:
   1. Wearing Surface: smooth
   2. Thickness: Per architectural drawings, ranging from feathered edge to 1”, per application. Applications greater than 1” require additional 3/8” aggregate to mix or as recommended by manufacturer.

D. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.

E. Compressive Strength: Minimum 4100 psi in 28 days in accordance with ASTM C109/C109M.

F. Flexural Strength: Minimum 1000 psi in 28 days in accordance with ASTM C348

G. Dry Time: Underlayment shall receive the application of moisture insensitive tile in 6 hours, floor coverings in 16 hours, and resinous flooring in 3-7 days.

H. Primer: compatible and as recommended by manufacturer for use over intended substrate

I. System Components: Manufacturer's standard components that are compatible with each other and as follows:
   1. Primer:
      a. Resin: copolymer
      b. Formulation Description: single component ready to use.
      c. Application Method: Squeegee and medium nap roller.
      d. All puddles shall be removed, and material shall be allowed to dry, 1-2 hours at 70F/21C.
      e. Number of Coats: (1) one.

2. Grout Resurfacing Base:
   a. Formulation Description: Single component, cementitious self-leveling high-early and high-ultimate strength grout.
   b. Application Method: colloidal mix pump, cam rake, spike roll.
      1) Thickness of Coats: Per architectural scope, 1” lifts.
      2) Number of Coats: More than one if needed.
   c. Aggregates: for applications greater than 1inch, require additional 3/8” aggregate to mix.
   J.

Property	Test	Value
Compressive Strength	ASTM C109/C109M	2,200 psi @ 24 hrs 3,000 psi @ 7 days
Initial set time Final Set time	ASTM C191	30-45 min. 1 to 1.5 hours
Bond Strength	ASTM D7234	100% bond to concrete failure

2.3 CEMENTITIOUS TROWEL-APPLIED UNDERLAYMENT(NOT SUITABLE FOR RESINOUS FLOOR FINISHES)

A. Underlayment shall be calcium aluminate cement-based, containing Portland cement. Gypsum-based products are unacceptable.
B. Compressive Strength: Minimum 4000 psi in 28 days
C. Trowel-applied underlayment shall not contain silica quartz (sand).
D. Dry Time: Underlayment shall receive the application of floor covering in 15-20 minutes.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degree C (60 degrees F), without interruption, for not less than 24 hours before testing and not less than three days after testing.
B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation.
C. Do not install materials when the temperatures of the substrate or materials are not within 60-85 degrees F/ 16-30 degrees C.

3.2 SURFACE PREPARATION

A. Existing concrete slabs with existing floor coverings:

1. Conduct visual observation of existing floor covering for adhesion, water damage, alkaline deposits, and other defects.
2. Remove existing floor covering and adhesives. Comply with local, state and federal regulations and the RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to the floor covering being removed.

B. Concrete shall meet the requirements of ASTM F710 and be sound, solid, clean, and free of all oil, grease, dirt, curing compounds, and any substance that might act as a bond-breaker before application. As required prepare slab by mechanical methods. No chemicals or solvents shall be used.

C. General: Prepare and clean substrates according to flooring manufacturer's written instructions for substrate indicated.

D. Prepare concrete substrates per ASTM D4259 as follows:
1. Dry abrasive blasting.
2. Wet abrasive blasting.
3. Vacuum-assisted abrasive blasting.
4. Centrifugal-shot abrasive blasting.
5. Comply with manufacturer's written instructions.

E. Repair damaged and deteriorated concrete according to flooring manufacturer's written recommendations.

F. Verify that concrete substrates are dry.

G. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of per flooring manufactures formal and project specific written recommendation.

H. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity per flooring manufacture’s formal and project specific written recommendation.

I. Provide a written report showing test placement and results.

J. Prepare joints in accordance with Section 07 92 00, JOINT SEALANTS and material manufacturer’s instructions.

K. Alkalinity: Measure surface pH in accordance with procedures provided in ASTM F710 or as outlined by qualified testing agency or flooring manufacturer’s technical representative.

L. Tolerances: Subsurface shall meet the flatness and levelness tolerance specified on drawings or recommended by the floor finish manufacturer. Tolerance shall also not to exceed 1/4” deviation in 10’. As required, install underlayment to achieve required tolerance.

M. Other Subsurface: For all other subsurface conditions, such as wood or metal, contact the floor finish or underlayment manufacturer, as appropriate, for proper preparation practices.

3.3 MOISTURE REMEDIATION COATING

A. Where results of relative humidity testing (ASTM F2170) exceed the requirements of the specified flooring manufacturer, apply remedial coating as specified to correct excessive moisture condition.

B. Prior to remedial floor coating installation mechanically prepare the concrete surface to provide a concrete surface profile in accordance with ASTM D4259.

C. Mix and apply moisture remediation coating in accordance with manufacturer’s instructions.

3.4 CEMENTITOUS UNDERLAYMENT

A. Install cementitious self-leveling underlayment as required to correct surface defects, floor flatness or levelness corrections to meet the tolerance requirements as or detailed on drawings, address non-moving cracks or joints, provide a smooth surface for the installation of floor covering, or meet elevation requirements detailed on drawings.

B. Mix and apply in accordance with manufacturer's instructions.

3.5 PROTECTION

A. Prior to the installation of the finish flooring, the surface of the underlayment should be protected from abuse by other trades by the use of plywood, tempered hardwood, or other suitable protection course

3.6 FIELD QUALITY CONTROL

A. Where specified, field sampling of products shall be conducted by a qualified, independent testing facility.

- - - E N D - - -

06-01-18

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies steel studs wall systems, shaft wall systems, ceiling or soffit suspended or furred framing, wall furring, fasteners, and accessories for the screw attachment of gypsum board, plaster bases or other building boards.

1.2 RELATED WORK

A. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.

B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.

D. Ceiling suspension systems for acoustical tile or panels and lay in gypsum board panels: Section 09 51 00, ACOUSTICAL CEILINGS Section 09 29 00, GYPSUM BOARD.

1.3 TERMINOLOGY

A. Description of terms shall be in accordance with ASTM C754, ASTM C11, ASTM C841 and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by beams, trusses, or bar joists. In interstitial spaces with walk-on floors the underside of the walk-on floor is the underside of structure overhead.

C. Thickness of steel specified is the minimum bare (uncoated) steel thickness.

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Studs, runners and accessories.
2. Hanger inserts.
3. Channels (Rolled steel).
4. Furring channels.
5. Screws, clips and other fasteners.

C. Shop Drawings:

1. Typical ceiling suspension system.

2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.

D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C754.

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. American Society For Testing And Materials (ASTM)

A641-09.....Zinc-Coated (Galvanized) Carbon Steel Wire

A653/653M-20.....Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.

C11-10.....Terminology Relating to Gypsum and Related Building Materials and Systems

C635-21.....Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings

C636-22.....Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

C645-20.....Non-Structural Steel Framing Members

C754-21.....Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

C841-19.....Installation of Interior Lathing and Furring

C954-21.....Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness

E580-19.....Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Moderate Seismic Restraint.

PART 2 - PRODUCTS

2.1 PROTECTIVE COATING

Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G40 or equivalent.

2.2 STEEL STUDS AND RUNNERS (TRACK)

A. ASTM C645, modified for thickness specified and sizes as shown.
   1. Use C 645 steel, 0.75 mm (0.0296-inch) minimum base-metal (30 mil).
   2. Runners same thickness as studs.
   3. Exception: Members that can show certified third party testing with gypsum board in accordance with ICC ES AC86 (Approved May 2012) need not meet the minimum thickness limitation or minimum section properties set forth in ASTM C 645. The submission of an evaluation report is acceptable to show conformance to this requirement. Use C 645 steel, 0.48mm (0.019 inch) minimum base-metal (19 mil).

B. Provide not less than two cutouts in web of each stud, approximately 300 mm (12 inches) from each end, and intermediate cutouts on approximately 600 mm (24-inch) centers.

C. Doubled studs for openings and studs for supporting concrete backer-board.

D. Studs 3600 mm (12 feet) or less in length shall be in one piece.

E. Shaft Wall Framing:
   1. Conform to rated wall construction.
   2. C-H Studs or C-T Studs.
   3. E Studs.
   4. J Runners.
   5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

A. Rigid furring channels (hat shape): ASTM C645.

B. Resilient furring channels:

1. Not less than 0.45 mm (0.0179-inch) thick bare metal.
2. Semi-hat shape, only one flange for anchorage with channel web leg slotted on anchorage side, channel web leg on other side stiffens fastener surface but shall not contact anchorage surface other channel leg is attached to.

C. "Z" Furring Channels:
1. Not less than 0.45 mm (0.0179-inch)-thick base metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.
2. Web furring depth to suit thickness of insulation.

D. Rolled Steel Channels: ASTM C754, cold rolled; or, ASTM C841, cold rolled.

2.4 FASTENERS, CLIPS, AND OTHER METAL ACCESSORIES

A. ASTM C754, except as otherwise specified.

B. For fire rated construction: Type and size same as used in fire rating test.

C. Fasteners for steel studs thicker than 0.84 mm (0.033-inch) thick. Use ASTM C954 steel drill screws of size and type recommended by the manufacturer of the material being fastened.

D. Clips: ASTM C841 (paragraph 6.11), manufacturer’s standard items. Clips used in lieu of tie wire shall have holding power equivalent to that provided by the tie wire for the specific application.

E. Concrete ceiling hanger inserts (anchorage for hanger wire and hanger straps): Steel, zinc-coated (galvanized), manufacturers standard items, designed to support twice the hanger loads imposed and the type of hanger used.

F. Tie Wire and Hanger Wire:
1. ASTM A641, soft temper, Class 1 coating.
2. Gage (diameter) as specified in ASTM C754 or ASTM C841.

G. Attachments for Wall Furring:
1. Manufacturers standard items fabricated from zinc-coated (galvanized) steel sheet.
2. For concrete or masonry walls: Metal slots with adjustable inserts or adjustable wall furring brackets. Spacers may be fabricated from 1 mm (0.0396-inch) thick galvanized steel with corrugated edges.

H. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.

2.5 SUSPENDED CEILING SYSTEM FOR GYPSUM BOARD (OPTION)

A. Conform to ASTM C635, heavy duty, with not less than 35 mm (1-3/8 inch) wide knurled capped flange face designed for screw attachment of gypsum board.

B. Wall track channel with 35 mm (1-3/8 inch) wide flange.

PART 3 - EXECUTION

3.1 INSTALLATION CRITERIA

A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.

B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.

B. Space studs not more than 610 mm (24 inches) on center.

C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.

D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.

E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions and insulated exterior wall furring.

G. Openings:

1. Frame jambs of openings in stud partitions and furring with two studs placed back to back or as shown.
2. Fasten back to back studs together with 9 mm (3/8-inch) long Type S pan head screws at not less than 600 mm (two feet) on center, staggered along webs.

3. Studs fastened flange to flange shall have splice plates on both sides approximately 50 X 75 mm (2 by 3 inches) screwed to each stud with two screws in each stud. Locate splice plates at 600 mm (24 inches) on center between runner tracks.

H. Fastening Studs:

1. Fasten studs located adjacent to partition intersections, corners and studs at jambs of openings to flange of runner tracks with two screws through each end of each stud and flange of runner.
2. Do not fasten studs to top runner track when studs extend to underside of structure overhead.

I. Chase Wall Partitions:

1. Locate cross braces for chase wall partitions to permit the installation of pipes, conduits, carriers and similar items.
2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).

J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.

K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.

B. Wall furring-Stud System:

1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.

C. Direct attachment to masonry or concrete; rigid channels or "Z" channels:

1. Install rigid (hat section) furring channels at 600 mm (24 inches) on center, horizontally or vertically.
2. Install "Z" furring channels vertically spaced not more than 600 mm (24 inches) on center.

3. At corners where rigid furring channels are positioned horizontally, provide mitered joints in furring channels.
4. Ends of spliced furring channels shall be nested not less than 200 mm (8 inches).
5. Fasten furring channels to walls with power-actuated drive pins or hardened steel concrete nails. Where channels are spliced, provide two fasteners in each flange.
6. Locate furring channels at interior and exterior corners in accordance with wall finish material manufacturers printed erection instructions. Locate "Z" channels within 100 mm (4 inches) of corner.

D. Installing Wall Furring-Bracket System: Space furring channels not more than 400 mm (16 inches) on center.

3.4 INSTALLING SUPPORTS REQUIRED BY OTHER TRADES

A. Provide for attachment and support of electrical outlets, plumbing, laboratory or heating fixtures, recessed type plumbing fixture accessories, access panel frames, wall bumpers, wood seats, toilet stall partitions, dressing booth partitions, urinal screens, chalkboards, tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

A. Conform to UL Design No. U438 for two-hour fire rating.

B. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with power driven fasteners at both ends and 600 mm (24 inches) on center.

C. After liner panels have been erected, cut C-H studs and E studs, from 9 mm (3/8-inch) to not more than 13 mm (1/2-inch) less than floor-to-ceiling height. Install C-H studs between liner panels with liner panels inserted in the groove.

D. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.

E. Suitably frame all openings to maintain structural support for wall:

1. Provide necessary liner fillers and shims to conform to label frame requirements.
2. Frame openings cut within a liner panel with E studs around perimeter.
3. Frame openings with vertical E studs at jambs, horizontal J runner at head and sill.

3.6 INSTALLING FURRED AND SUSPENDED CEILINGS OR SOFFITS

A. Install furred and suspended ceilings or soffits in accordance with ASTM C754 or ASTM C841 except as otherwise specified or shown for screw attached gypsum board ceilings and for plaster ceilings or soffits.

1. Space framing at 400 mm (16-inch) centers for metal lath anchorage.
2. Space framing at 600 mm (24-inch) centers for gypsum board anchorage.

C. Concrete slabs on steel decking composite construction:

1. Use pull down tabs when available.
2. Use power activated fasteners when direct attachment to structural framing can not be accomplished.

D. Where bar joists or beams are more than 1200 mm (48 inches) apart, provide intermediate hangers so that spacing between supports does not exceed 1200 mm (48 inches). Use clips, bolts, or wire ties for direct attachment to steel framing.

E. Existing concrete construction exposed or concrete on steel decking:

1. Use power actuated fasteners either eye pin, threaded studs or drive pins for type of hanger attachment required.
2. Install fasteners at approximate mid height of concrete beams or joists. Do not install in bottom of beams or joists.

F. Steel decking without concrete topping:

1. Do not fasten to steel decking 0.76 mm (0.0299-inch) or thinner.
2. Toggle bolt to decking 0.9 mm (0.0359-inch) or thicker only where anchorage to steel framing is not possible.

G. Installing suspended ceiling system for gypsum board (ASTM C635 Option):

1. Install only for ceilings to receive screw attached gypsum board.
2. Install in accordance with ASTM C636.
   a. Install main runners spaced 1200 mm (48 inches) on center.
   b. Install 1200 mm (four foot) tees not over 600 mm (24 inches) on center; locate for edge support of gypsum board.
   c. Install wall track channel at perimeter.

H. Installing Ceiling Bracing System:
1. Construct bracing of 38 mm (1-1/2 inch) channels for lengths up to 2400 mm (8 feet) and 50 mm (2 inch) channels for lengths over 2400 mm (8 feet) with ends bent to form surfaces for anchorage to carrying channels and over head construction. Lap channels not less than 600 mm (2 feet) at midpoint back to back. Screw or bolt lap together with two fasteners.
2. Install bracing at an approximate 45 degree angle to carrying channels and structure overhead; secure as specified to structure overhead with two fasteners and to carrying channels with two fasteners or wire ties.
3. Brace suspended ceiling or soffit framing in seismic areas in accordance with ASTM E580.

3.7 TOLERANCES

A. Fastening surface for application of subsequent materials shall not vary more than 3 mm (1/8-inch) from the layout line.
B. Plumb and align vertical members within 3 mm (1/8-inch.)
C. Level or align ceilings within 3 mm (1/8-inch.)

- - - E N D - - -

01-01-21

SECTION 09 23 00
GYPSUM PLASTERING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies metal and gypsum lathing and gypsum plaster.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 08 31 13, ACCESS DOORS AND FRAMES: Access Doors.

C. Section 09 22 16, NON-STRUCTURAL METAL FRAMING Steel framing members for attachment of plaster bases.

1.3 TERMINOLOGY

A. Definitions and description of terms to be in accordance with ASTM C11, ASTM C841, and ASTM C842 and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead is the underside of the floor or roof construction supported by beams, trusses, and bar joists.

C. Self-furring Lath: Metal plastering bases having dimples or crimps designed to hold the back plane of the lath 6 to 10 mm (1/4 to 3/8 inch) away from the plane of the solid backing.

D. Solid Backing or Solid Bases: Concrete, masonry, sheathing, rigid insulation, and similar materials to which plaster is directly applied.

E. Wet Areas: Areas of a building where cyclic or continuous exposure to very humid or wet conditions, or in which a dew point condition may occur in the plaster.

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 consumer recycled content as described in PART 2 - PRODUCTS.

C. Shop Drawings:

1. Details of floating interior angle unrestrained construction.

2. Details of assembly and anchorage of lath and accessories.

D. Manufacturers' Literature and Data:

1. Accessories for plaster, each type.
2. Metal plaster bases, each type.
3. Fasteners.
4. Bonding compounds, including application instructions.
5. Admixtures, including mixing and application instructions.

E. Manufacturers certificates:
1. Gypsum plaster.

F. Samples: Accessories for plaster, each type, not less than 152 mm (6 inches) long.

G. Installer qualifications.

1.5 DELIVERY, STORAGE, AND PROTECTION

A. Deliver manufactured materials in the manufacturers' original unbroken packages or containers which are labeled plainly with the manufacturers' names and brands. Keep cementitious materials dry and stored off the ground, under cover, and away from sweating walls and other damp surfaces until ready for use.

1.6 PROJECT CONDITIONS

A. Comply with ASTM C842 requirements.

B. Maintain work areas at not less than 13 degrees C (55 degrees F) or greater than 27 degrees C (80 degrees F) for not less than one (1) week prior to application of plaster, continuously during application of plaster, and one (1) week after plaster has set or until plaster has dried.

1.7 QUALITY ASSURANCE

A. Installers qualifications: Work to be performed by installer having a minimum of three (3) years' experience for work relating to this Section.

1.8 PERFORMANCE REQUIREMENTS

A. Where indicated on construction documents, provide gypsum plaster assemblies identical to those of assemblies tested for fire resistance according to ASTM E119 by a qualified testing agency.

B. Where indicated on construction documents provide gypsum plaster assemblies identical to those of assemblies tested for STC ratings according to ASTM E90 and classified according to ASTM E413 by a qualified testing agency.

1.9 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 basic designation only.

B. ASTM International (ASTM):

A641/A641M-19.....Zinc-Coated (Galvanized) Carbon Steel Wire

A653/A653M-20.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

C11-21.....Terminology Relating to Gypsum and Related Building Materials and Systems.

C28/C28M-18.....Gypsum Plasters

C35-20.....Inorganic Aggregates for Use in Gypsum Plaster

C206-17.....Finishing Hydrated Lime

C472-13.....Physical Testing of Gypsum, Gypsum Plaster and Gypsum Concrete

C631-19.....Bonding Compounds for Interior Gypsum Plastering

C841-19.....Installation of Interior Lathing and Furring

C842-19.....Application of Interior Gypsum Plaster

C847-20.....Metal Lath

C1002-20.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

D3678-20.....Rigid Poly (Vinyl Chloride) (PVC) Interior-Profile Extrusions

E413-20.....Classification for Rating Sound Insulation

E90-19.....Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements

C. Commercial Item Description (CID):

A-A-55615-95(R2006).....Shield, Expansion; (Wood Screw and Log Bolt Self-Threading Anchor)

PART 2 - PRODUCTS

2.1 PLASTERING BASES (LATH)

A. Expanded-Metal Lath: ASTM C847, cold-rolled carbon-steel sheet with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.

1. Paper Backing: Kraft paper factory bonded to back of lath.
2. Diamond-Mesh Lath:
   a. Type: Self-furring.
   b. Weight: 1.4 kg/square meter (2.5 pound/square yard) 1.8 kg/square meter (3.4 pound square yard) .
3. Recycled Content of Metal Products: Post-consumer plus one-half of consumer content not less than 30 percent.

B. Gypsum Lath:

1. Sheet; 610 mm x 2438 mm (2 feet. x 8 feet.).
2. 10 mm (3/8 inch) thick.
3. Type "X" for fire rated assemblies.

2.2 GYPSUM PLASTERS

A. Base Coat: High strength gypsum plaster with a minimum average, dry compressive strength of 19 MPa (2800 psi) according to ASTM C472 for a mix of 45 kg (100 pounds) of plaster and .06 cubic meter (2 cubic feet) of sand.

B. Finish Coat: High strength gypsum gauging plaster with a minimum average dry compressive strength of 34 MPa (5000 pounds square inch) according to ASTM C472.

2.3 LIME

A. ASTM C206, Type S.

2.4 AGGREGATES:

A. Natural sand, except grade aggregates in accordance with ASTM C35, "TABLE 1".

B. Vermiculite and perlite aggregates are not acceptable, except where required for fire rated assemblies.

2.5 BONDING COMPOUND (FOR INTERIOR WORK)

A. ASTM C631, except water re-emulsifiable compound is prohibited.

2.6 ACCESSORIES FOR GYPSUM PLASTER

A. General: Coordinate depth of trim and accessories with thicknesses and number of plaster coats required as per ASTM C841.

B. Cornerites: Fabricated from expanded-metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.

C. Strip lath: Fabricated from expanded-metal lath with ASTM A653/A653M, G60 (Z180), hot-dip galvanized-zinc coating.

D. Cornerbeads: Fabricated from zinc-coated (galvanized) steel.

1. Small Bullnose cornerbead with expanded flanges; use unless otherwise indicated on construction documents.
2. Small Bullnose cornerbead with perforated flanges; use on curved corners.
3. Small Bullnose cornerbead with expanded flanges reinforced by perforated stiffening rib; use on columns and for finishing unit masonry corners.
4. Bullnose cornerbead, radius 19 mm (3/4 inch) minimum, with expanded flanges; use at locations indicated on construction documents.

E. Casing Beads: Fabricated from zinc-coated (galvanized) steel; square-edged style; with expanded flanges.

F. Control Joints: Fabricated from zinc-coated (galvanized) steel; one-piece type, folded pair of unperforated screeds in M-shaped configuration; with perforated flanges and removable protective tape on plaster face of control joint.

2.7 FASTENERS

A. Tie wire, screws, staples, clips, nails, and other fasteners ASTM C841, except as otherwise specified.

B. Provide fasteners for securing metal plastering bases having heads or inserted through washers large enough to engage two strands (1 on each side of the washer) of the metal plastering base.

C. For fire rated construction type and size as used in fire rated test.

D. Screws: ASTM C1002.

E. Expansion Shields: CID A-A-55615.

PART 3 - EXECUTION

3.1 APPLYING LATH BASES

A. Apply lath base in accordance with ASTM C841, except as otherwise specified or shown.

B. Provide metal plastering bases where plaster is required on partitions, ceilings and furring, where required for setting ceramic tile in adhesive on gypsum plaster and for light troughs, beams and other curved or irregular surfaces.

1. Where plaster is required on solid bases, metal plastering bases are not required, unless shown on the construction documents.
2. Form true surfaces, straight or in moderate curves where shown on construction documents, without sags or buckles and with long dimension of lath at right angles to direction of supports.
3. Shape lathing to within 19 mm (3/4 inch) of finished profiles of irregular surfaces.
4. Terminate lath for ceiling construction at casing bead (Floating Angle Construction) where butting into or penetrated by walls, columns, beams, and similar elements.

C. Gypsum lath may be used in lieu of expanded metal lath for gypsum plaster only on straight flat surfaces of partitions and walls, and on furring, except for lathing in wet areas and as a base for marble finishes.

D. Installing Metal Plastering Bases:
1. Select type of expanded metal lath to conform to Table 2 of ASTM C841.
2. Select type of fasteners based upon expanded metal lath type to be installed to conform to Table 1 of ASTM C841.
3. Where metal plastering bases are required over solid backing, provide self-furring, diamond-mesh lath type.
4. Attach self-furring diamond-mesh lath directly to masonry and concrete with hardened nails, power actuated drive pins. Locate fasteners at the dimples or crimps only.
5. Where metal plastering bases are required over steel columns and stud less solid plaster partitions supports by L-runners, provide rib lath.
6. Provide rib lath above ceramic title wainscots where the finish above the wainscot is required to finish flush with the tile face.
7. Do not install continuous plastering bases through expansion and control joints. Terminate plastering base at each side of joint.

3.2 SURFACE PREPARATION OF SOLID BASES

A. Prepare in accordance with ASTM C842, except as otherwise specified.

B. Terminate concrete form ties and other metal projections not less than 3.2 mm (1/8 inch) below the surface of concrete.

C. Remove projections and fill depressions, holes, cracks and similar voids flush with patching compound compatible with the substrate and plaster, within the tolerance, specified in ASTM C842.

D. Clean existing concrete surfaces specified to receive plaster to ensure bonding as specified in ASTM C842.

E. Condition new or existing concrete surfaces specified to receive plaster by applying bonding compound as specified in ASTM C842.

F. Condition existing, concrete and masonry surfaces (solid backing) specified to receive plaster by applying metal plastering base as specified in ASTM C842.

3.3 INSTALLING PLASTERING ACCESSORIES

A. Install accessories in accordance with ASTM C841, except as follows:

1. Set plastering accessories plumb, level and true to line, mitered at corners and intersections, and securely attach to supporting surfaces.
2. Install in one piece, within the limits of the longest commercially available lengths.
3. Wood plugs are not acceptable anchorage for fasteners.

B. Corner Beads: Install at external plaster corners.

C. Strip Lath:

1. Install centered over joints between dissimilar materials, such as clay tile, brick, concrete masonry units, concrete, and expanded metal and gypsum lath. Install where surfaces are required to be plastered and are in contact with each other in same plane, except where expansion joints and casing beads are required.
2. Wire tie, staple, screw, or nail strip lath to base along both edges at not over 152 mm (6 inches) on centers.
3. Reinforce gypsum lath at corners of openings, at internal corners, and at chases and similar breaks in continuity in accordance with ASTM C841.

D. Casing Beads:

1. Provide at locations where plaster terminates against other materials.
2. Provide where indicated in construction documents.

3. Provide where plaster terminates against trim of steel frames and trim of other materials and equipment, except where trim overlaps plaster.
4. Provide where plaster for new walls or furring (vertical or horizontal) terminates against existing construction.
5. Provide around perimeter of openings for recessed casework and equipment, except where edge is covered by flanges. Locate to conform to dimensions shown on approved shop drawings.
6. Both sides of expansion and control joints, unless shown otherwise.
7. Where ceilings butt into or are penetrated by walls, columns, beams, and similar elements so as to provide floating angle (unrestrained) construction in accordance with ASTM C841.

E. Cornerites:

1. Provide at interior corners of walls, partitions, and other vertical surfaces to be plastered, except where lath is carried around angle.
2. Fasten only as necessary to retain position during plastering.
3. Omit Cornerites at junction of new plastered walls with existing plastered walls.
4. Provide where metal plastering bases are specified not to be carried around internal angles, and at locations where casing beads are specified and shown.

F. Control Joints:

1. Where control joints are placed parallel to framing members, install joints within 101 mm (4 inches) of framing member.
2. Install control joints only to the edges of abutting sheets of lath so that the lath is not continuous or tied across joint.
3. Extend control joints the full width and height of the wall or length of soffit/ceiling plaster membrane.

3.4 GYPSUM PLASTER APPLICATION

A. Proportion, mix, and apply plaster in accordance with ASTM C842.

B. Thickness of Plaster: ASTM C842, except as follows:

1. Where greater thickness is indicated on construction documents.
2. Where thickness is required to match existing.
3. On metal plaster base 19 mm (3/4 inch), except where greater thickness is required for fire rated construction.

4. Apply finish coats to a uniform thickness of approximately 2 mm (1/16 inch) with not more than 3 mm (1/8 inch) thickness at any point.

C. Cut 2 mm (1/16 inch) deep V-joint in finish coat of plaster adjacent to metal door frames and wherever plaster finishes flush with other materials, except where casing beads are required. Omit 2 mm (1/16 inch) deep V-joint on walls and partitions where plaster is recessed back from face of door frames, or similar conditions.

D. Plaster to have a smooth-trowel finish unless specified or shown otherwise.

E. Apply gypsum plaster in three (3) coats except as follows: Gypsum plaster applied to masonry and gypsum lath using the two-coat double back method.

F. Gypsum Plaster Base Coat: Apply base coats with sufficient pressure and ensure plaster is sufficiently plastic to provide a strong bond to bases. Work base coats into screeds at intervals from 1524 to 2438 mm (5 to 8 feet). Plaster must not be continuous across expansion and control joints occurring in walls, partitions, and ceilings. Finish work level, plumb, square, and true, within a tolerance of 3 mm in 2438 mm (1/8 inch in 8 feet) without waves, cracks, blisters, pits, crazing, discoloration, projections, or other imperfections. Form plaster work carefully around angles and contours, and well up to screeds. Take special care to prevent sagging and consequent dropping of applications. There must be no visible junction marks in finish coat where one day’s work adjoins another.

1. Gypsum Two-Coat Base Coat: Apply the first coat to cover the base with sufficient material and pressure to form a good bond on the wall or ceiling base. Before the first coat has set and without scratching or cracking the surface, apply a second coat (double back) of the same material proportion as the base coat to the screeds. Straighten to a true surface without application of water, and cross rake or scratch to receive the finish coat.
2. Gypsum Three-Coat Base Coat: Apply scratch coat 5 to 6 mm (3/16 to 1/4 inch) thick to cover the base with sufficient material and pressure to form a good bond on the wall or ceiling base. Rake or scratch the surface and allow to set firm and hard. Apply the brown

coat to bring the base coat out to the screeds, compact, and straighten to a true surface without the application of water, and cross rake or scratch to receive the finish coat.

G. Gypsum Plaster Finish Coats: Moderately moisten or fog spray base coat of plaster that has become dry before finish coat is applied. Accelerate plaster, if necessary, to provide a setting time of not more than four (4) hours from the time the plaster is mixed.

1. Lime-Putty and Gypsum Gauged Finish Coat: Apply lime-putty gypsum finish white coat over the base coat, scratch in thoroughly, lay on well, double back, and fill out to a true, even surface. Allow the finish to dry not more than five (5) minutes, then trowel well with water. Apply maximum pressure in order to compact the finish coat and provide a smooth finish free from blemishes and irregularities. Apply trowel finish coats of gypsum-gauged lime-putty over properly prepared base coats as thin as possible and 2 to 3 mm (1/16 to 1/8 inch) thick for conventional plaster system, except as necessary in spots to level out hollows in base coat.

H. Concealed Plaster:

1. Where plaster is concealed behind built in cabinets, furnishings, or equipment, apply finish coat.
2. Where plaster is concealed above ceilings, omit finish coat.
3. Where plaster is used as a base for adhesive application of tile and similar finishes, omit finish coat.

3.5 PATCHING

A. After all work except painting is finished, point around trim, frames, and similar items.

B. Patch damaged plaster to match previously applied plaster in color and texture.

C. Sanding plaster is prohibited.

D. Patch, alter and replace existing plaster surfaces as required to complete work.

E. Patching of Rated Construction: Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with patching plaster. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with same materials used in construction so as to provide fire protection equivalent to the fire rated construction, STC

equivalent to the sound rated construction, and construction that will not permit the passage of smoke.

3.6 CLEANING AND PROTECTION

A. Remove temporary protection and enclosure of other work after plastering is complete. Remove droppings or spattering's from other surfaces not indicated to be plastered. Leave clean and in a condition to receive paint or other finish.

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SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 DESCRIPTION

This section specifies installation and finishing of gypsum board.

1.2 RELATED WORK

A. Installation of steel framing members for walls, partitions, furring, soffits, and ceilings: Section 05 40 00, COLD-FORMED METAL FRAMING, and Section 09 22 16, NON-STRUCTURAL METAL FRAMING.

C. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

F. Lay in gypsum board ceiling panels: Section 09 51 00, ACOUSTICAL CEILING.

1.3 TERMINOLOGY

A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.

B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.

C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Cornerbead and edge trim.
2. Finishing materials.
3. Laminating adhesive.
4. Gypsum board, each type.

C. Shop Drawings:

1. Typical gypsum board installation, showing corner details, edge trim details and the like.
2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
3. Typical shaft wall assembly.

4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:
   1. Cornerbead.
   2. Edge trim.
   3. Control joints.

E. Test Results:
   1. Fire rating test, each fire rating required for each assembly.
   2. Sound rating test.

F. Certificates: Certify that gypsum board types, gypsum backing board types, cementitious backer units, and joint treating materials do not contain asbestos material.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

In accordance with the requirements of ASTM C840.

1.7 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):

C11-23.....Terminology Relating to Gypsum and Related Building Materials and Systems

C475-17.....Joint Compound and Joint Tape for Finishing Gypsum Board

C840-20.....Application and Finishing of Gypsum Board

C919-22.....Sealants in Acoustical Applications

C954-22.....Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Stud from 0.033 in. (0.84mm) to 0.112 in. (2.84mm) in thickness

C1002-22.....Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs

C1047-19.....Accessories for Gypsum Wallboard and Gypsum Veneer Base

C1177-17.....Glass Mat Gypsum Substrate for Use as Sheathing

C1178/C1178M-18.....Specification for Coated Glass Mat Water Resistant Backing Panel

C1658-19.....Glass Mat Gypsum Panels

C1396-17.....Gypsum Board

C. Underwriters Laboratories Inc. (UL):

Latest Edition.....Fire Resistance Directory

D. Inchcape Testing Services (ITS):

Latest Editions.....Certification Listings

PART 2 - PRODUCTS

2.1 GYPSUM BOARD

A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise.

B. Coreboard or Shaft Wall Liner Panels.

1. ASTM C1396, Type X.
2. ASTM C1658: Glass Mat Gypsum Panels,
3. Coreboard for shaft walls 300, 400, 600 mm (12, 16, or 24 inches) wide by required lengths 25 mm (one inch) thick with paper faces treated to resist moisture.

C. Water Resistant Gypsum Backing Board: ASTM C1178, Type X, 16 mm (5/8 inch) thick.

D. Paper facings shall contain 100 percent post-consumer recycled paper content.

2.2 GYPSUM SHEATHING BOARD

A. ASTM C1396, Type X, water-resistant core, 16 mm (5/8 inch) thick.

B. ASTM C1177, Type X.

2.3 ACCESSORIES

A. ASTM C1047, except form of 0.39 mm (0.015 inch) thick zinc coated steel sheet or rigid PVC plastic.

B. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.

2.4 FASTENERS

A. ASTM C1002 and ASTM C840, except as otherwise specified.

B. ASTM C954, for steel studs thicker than 0.04 mm (0.33 inch).

C. Select screws of size and type recommended by the manufacturer of the material being fastened.

D. For fire rated construction, type and size same as used in fire rating test.

E. Clips: Zinc-coated (galvanized) steel; gypsum board manufacturer's standard items.

2.5 FINISHING MATERIALS AND LAMINATING ADHESIVE

ASTM C475 and ASTM C840. Free of antifreeze, vinyl adhesives, preservatives, biocides and other VOC. Adhesive shall contain a maximum VOC content of 50 g/l.

PART 3 - EXECUTION

3.1 GYPSUM BOARD HEIGHTS

A. Extend all layers of gypsum board from floor to underside of structure overhead on following partitions and furring:

1. Two sides of partitions:
   a. Fire rated partitions.
   b. Smoke partitions.
   c. Sound rated partitions.
   d. Full height partitions shown (FHP).
   e. Corridor partitions.
2. One side of partitions or furring:
   a. Inside of exterior wall furring or stud construction.
   b. Room side of room without suspended ceilings.
   c. Furring for pipes and duct shafts, except where fire rated shaft wall construction is shown.
3. Extend all layers of gypsum board construction used for fireproofing of columns from floor to underside of structure overhead, unless shown otherwise.

B. In locations other than those specified, extend gypsum board from floor to heights as follows:

1. Not less than 100 mm (4 inches) above suspended acoustical ceilings.
2. At ceiling of suspended gypsum board ceilings.
3. At existing ceilings.

3.2 INSTALLING GYPSUM BOARD

A. Coordinate installation of gypsum board with other trades and related work.

B. Install gypsum board in accordance with ASTM C840, except as otherwise specified.

C. Moisture and Mold-Resistant Assemblies: Provide and install moisture and mold-resistant glass mat gypsum wallboard products with moisture-resistant surfaces complying with ASTM C1658 where shown and in locations which might be subject to moisture exposure during construction.

D. Use gypsum boards in maximum practical lengths to minimize number of end joints.

E. Bring gypsum board into contact, but do not force into place.

F. Ceilings:

1. For single-ply construction, use perpendicular application.
2. For two-ply assembles:
   a. Use perpendicular application.
   b. Apply face ply of gypsum board so that joints of face ply do not occur at joints of base ply with joints over framing members.

G. Walls (Except Shaft Walls):

1. When gypsum board is installed parallel to framing members, space fasteners 300 mm (12 inches) on center in field of the board, and 200 mm (8 inches) on center along edges.
2. When gypsum board is installed perpendicular to framing members, space fasteners 300 mm (12 inches) on center in field and along edges.
3. Stagger screws on abutting edges or ends.
4. For single-ply construction, apply gypsum board with long dimension either parallel or perpendicular to framing members as required to minimize number of joints except gypsum board shall be applied vertically over "Z" furring channels.
5. For two-ply gypsum board assemblies, apply base ply of gypsum board to assure minimum number of joints in face layer. Apply face ply of wallboard to base ply so that joints of face ply do not occur at joints of base ply with joints over framing members.

6. For three-ply gypsum board assemblies, apply plies in same manner as for two-ply assemblies, except that heads of fasteners need only be driven flush with surface for first and second plies. Apply third ply of wallboard in same manner as second ply of two-ply assembly, except use fasteners of sufficient length enough to have the same penetration into framing members as required for two-ply assemblies.
7. No offset in exposed face of walls and partitions will be permitted because of single-ply and two-ply or three-ply application requirements.
8. Installing Two Layer Assembly Over Sound Deadening Board:
   a. Apply face layer of wallboard vertically with joints staggered from joints in sound deadening board over framing members.
   b. Fasten face layer with screw, of sufficient length to secure to framing, spaced 300 mm (12 inches) on center around perimeter, and 400 mm (16 inches) on center in the field.

9. Control Joints ASTM C840 and as follows:
   a. Locate at both side jambs of openings if gypsum board is not "yoked". Use one system throughout.
   b. Not required for wall lengths less than 9000 mm (30 feet).
   c. Extend control joints the full height of the wall or length of soffit/ceiling membrane.

H. Acoustical or Sound Rated Partitions, Fire and Smoke Partitions:

1. Cut gypsum board for a space approximately 3 mm to 6 mm (1/8 to 1/4 inch) wide around partition perimeter.
2. Coordinate for application of caulking or sealants to space prior to taping and finishing.
3. For sound rated partitions, use sealing compound (ASTM C919) to fill the annular spaces between all receptacle boxes and the partition finish material through which the boxes protrude to seal all holes and/or openings on the back and sides of the boxes. STC minimum values as shown.

I. Electrical and Telecommunications Boxes:

1. Seal annular spaces between electrical and telecommunications receptacle boxes and gypsum board partitions.

J. Accessories:

1. Set accessories plumb, level and true to line, neatly mitered at corners and intersections, and securely attach to supporting surfaces as specified.
2. Install in one piece, without the limits of the longest commercially available lengths.
3. Corner Beads:
   a. Install at all vertical and horizontal external corners and where shown.
   b. Use screws only. Do not use crimping tool.
4. Edge Trim (casings Beads):
   a. At both sides of expansion and control joints unless shown otherwise.
   b. Where gypsum board terminates against dissimilar materials and at perimeter of openings, except where covered by flanges, casings or permanently built-in equipment.
   c. Where gypsum board surfaces of non-load bearing assemblies abut load bearing members.
   d. Where shown.

3.3 INSTALLING GYPSUM SHEATHING

A. Install in accordance with ASTM C840, except as otherwise specified or shown.

B. Use screws of sufficient length to secure sheathing to framing.

C. Space screws 9 mm (3/8 inch) from ends and edges of sheathing and 200 mm (8 inches) on center. Space screws a maximum of 200 mm (8 inches) on center on intermediate framing members.

D. Apply 600 mm by 2400 mm (2 foot by 8 foot) sheathing boards horizontally with tongue edge up.

E. Apply 1200 mm by 2400 mm or 2700 mm (4 ft. by 8 ft. or 9 foot) gypsum sheathing boards vertically with edges over framing.

3.4 CAVITY SHAFT WALL

A. Coordinate assembly with Section 09 22 16, NON-STRUCTURAL METAL FRAMING, for erection of framing and gypsum board.

B. Conform to UL Design No. U438 or FM WALL CONSTRUCTION 12-2/HR (Nonbearing for two-hour fire rating.

C. Cut coreboard (liner) panels 25 mm (one inch) less than floor-to-ceiling height, and erect vertically between J-runners on shaft side.
   1. Where shaft walls exceed 4300 mm (14 feet) in height, position panel end joints within upper and lower third points of wall.
   2. Stagger joints top and bottom in adjacent panels.
   3. After erection of J-struts of opening frames, fasten panels to J-struts with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.

D. Gypsum Board:
   1. Two hour wall:
      a. Erect base layer (backing board) vertically on finish side of wall with end joints staggered. Fasten base layer panels to studs with 25 mm (one inch) long screws, spaced 600 mm (24 inches) on center.
      b. Use laminating adhesive between plies in accordance with UL or FM if required by fire test.
      c. Apply face layer of gypsum board required by fire test vertically over base layer with joints staggered and attach with screws of sufficient length to secure to framing staggered from those in base, spaced 300 mm (12 inches) on center.
   2. One hour wall with one layer on finish side of wall: Apply face layer of gypsum board vertically. Attach to studs with screws of sufficient length to secure to framing, spaced 300 mm (12 inches) on center in field and along edges.
   3. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

E. Treat joints, corners, and fasteners in face layer as specified for finishing of gypsum board.

3.5 FINISHING OF GYPSUM BOARD

A. Finish joints, edges, corners, and fastener heads in accordance with ASTM C840. Use Level 4 finish for al finished areas open to public view.

B. Before proceeding with installation of finishing materials, assure the following:
   1. Gypsum board is fastened and held close to framing or furring.

2. Fastening heads in gypsum board are slightly below surface in dimple formed by driving tool.

C. Finish joints, fasteners, and all openings, including openings around penetrations, on that part of the gypsum board extending above suspended ceilings to seal surface of non decorated smoke barrier, fire rated and sound rated gypsum board construction. After the installation of hanger rods, hanger wires, supports, equipment, conduits, piping and similar work, seal remaining openings and maintain the integrity of the smoke barrier, fire rated and sound rated construction/ Sanding is not required of non decorated surfaces.

3.6 REPAIRS

A. After taping and finishing has been completed, and before decoration, repair all damaged and defective work, including nondecorated surfaces.

B. Patch holes or openings 13 mm (1/2 inch) or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.

C. Repair holes or openings over 13 mm (1/2 inch) diameter, or equivalent size, with 16 mm (5/8 inch) thick gypsum board secured in such a manner as to provide solid substrate equivalent to undamaged surface.

D. Tape and refinish scratched, abraded or damaged finish surfaces including cracks and joints in non decorated surface to provide smoke tight construction fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

3.7 UNACCESSIBLE CEILINGS

At Mental Health and Behavioral Nursing Units, areas accessible to patients and not continuously observable by staff (e.g., patient bedrooms, day rooms), ceilings should be a solid material such as gypsum board. This will limit patient access. Access doors are needed to access electrical and mechanical equipment above the ceiling. These doors should be locked to prevent unauthorized access and secured to ceiling using tamper resistant fasteners.

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SECTION 09 30 13
CERAMIC/PORCELAIN TILING

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies interior ceramic, porcelain and quarry tile, marble thresholds and window stools, terrazzo divider strips, waterproofing membranes for thin-set applications, crack isolation membranes, and tile backer board.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 07 92 00, JOINT SEALANTS: Sealing of Joints.

C. Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES: Preformed expansion joints in tile flooring.

D. Section 09 65 19, RESILIENT TILE FLOORING: Metal and Resilient Edge Strips at Joints with New Resilient Flooring.

E. Section 09 68 00, CARPETING: Metal and Resilient Edge Strips at Joints with Carpeting.

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. Samples:

1. Base tile, each type, each color, each size.
2. Mosaic floor tile panels, 228 by 228 mm (9 by 9 inches), each type, color, size and pattern.
3. Paver tile, each size, type, color and pattern.
4. Quarry tile, each type, color, and size.
5. Porcelain tile, each type, color, patterns and size.
6. Wall (or wainscot) tile, each color, size and pattern.
7. Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, color, and size.

8. Therapeutic pool tile, panels 305 mm (12 inches) square, each type, size, color, typical lettering and special shapes.

D. Product Data:

1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
2. Chemical resistant mortar and grout (epoxy and furan).
3. Cementitious backer unit.
4. Dry-set portland cement mortar and grout.
5. Divider strip.
6. Elastomeric membrane and bond coat.
7. Reinforcing tape.
8. Leveling compound.
9. Latex-portland cement mortar and grout.
10. Commercial portland cement grout.
11. Organic adhesive.
12. Slip resistant tile.
13. Waterproofing isolation membrane.
14. Fasteners.

E. Certification:

1. Master grade certificate, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
   a. Chemical resistant mortar and grout (epoxy and furan).
   b. Modified epoxy emulsion.
   c. Commercial portland cement grout.
   d. Cementitious backer unit.
   e. Dry-set portland cement mortar and grout.
   f. Elastomeric membrane and bond coat.
   g. Reinforcing tape.
   h. Latex-portland cement mortar and grout.
   i. Leveling compound.
   j. Organic adhesive.
   k. Waterproof isolation membrane.
   l. Factory back mounted tile documentation for suitability for application in wet area.

F. Installer Qualifications:

1. Submit letter stating installer's experience.

1.4 DELIVERY AND STORAGE

A. Deliver materials in containers with labels legible and intact and grade-seals unbroken.

B. Store material to prevent damage or contamination.

1.5 QUALITY ASSURANCE

A. Installers to be from a company specializing in performing installation of products specified and have a minimum of three (3) years' experience.

B. Each type and color of tile to be provided from a single source.

C. Each type and color of mortar, adhesive, and grout to be provided from the same source.

1.6 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

1.7 APPLICABLE PUBLICATIONS

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in text by basic designation only.

B. American National Standards Institute (ANSI):

A10.20-06(R2016).....Safe Operating Practices for Tile, Terrazzo and Marble Work

A108/A118/A136.1:2024...Installation of Ceramic Tile

A108.01-23.....Subsurfaces and Preparations by Other Trades

A108.02-23.....Materials, Environmental, and Workmanship

A108.1A-23.....Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar

A108.1B-23.....Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar

A108.1C-23.....Contractors Option; Installation of Ceramic Tile in the Wet-Set method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar

A108.4-23.....Ceramic Tile with Organic Adhesives or Water Cleanable Tile-Setting Epoxy Adhesive

A108.5-23 .....Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar

A108.6-23.....Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy

A108.8-23.....Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout

A108.9-23.....Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout

A108.10-23.....Grout in Tilework

A108.11-23.....Interior Installation of Cementitious Backer Units

A108.12-23.....Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar

A108.13-23.....Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone

A108.14-23.....Paper-Faced Glass Mosaic Tile

A108.15-23.....Alternate Method: Paper-Faced Glass Mosaic Tile

A108.17-23.....Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone

A118.1-22.....Dry-Set Portland Cement Mortar

A118.3-22.....Chemical Resistant, Water Cleanable Tile-Setting and –Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive

A118.4-22.....Modified Dry-Set Cement Mortar

A118.5-22.....Chemical Resistant Furan Mortars and Grouts

A118.6-22.....Standard Cement Grouts for Tile Installation

A118.7-22.....High Performance Cement Grouts for Tile Installation

A118.8-22.....Modified Epoxy Emulsion Mortar/ Grout

A118.9-22.....Cementitious Backer Units

A118.10-22.....Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation

A118.11-22.....EGP (Exterior Glue Plywood) Modified Dry-set Mortar

A118.12-14.....Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation

A118.13-14.....Bonded Sound Reduction Membranes for Thin-Set Ceramic Tile Installation

A118.15-19.....Improved Modified Dry-Set Cement Mortar

A136.1-13.....Organic Adhesives for Installation of Ceramic Tile

A137.1-22.....American National Standard Specifications for Ceramic Tile

C. ASTM International (ASTM):

A666-24.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar

A1064/A1064M-22.....Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

C109/C109M-23.....Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or [50-mm] Cube Specimens)

C241/C241M-21.....Abrasion Resistance of Stone Subjected to Foot Traffic

C348-21.....Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars

C627-18.....Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester

C954-22.....Steel Drill Screws for the Application of Gypsum Board on Metal Plaster Base to Steel Studs from 0.033 in (0.84 mm) to 0.112 in (2.84 mm) in thickness

C979/C979M-16.....Pigments for Integrally Colored Concrete

C1002-22.....Steel Self-Piercing Tapping Screws for the Application of Panel Products

C1027-19.....Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile

C1127/C1127M-15.....Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface

C1178/C1178M-18.....Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel

C1325-22.....Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units

C1353/C1353M-20e1.....Abrasion Resistance of Dimension Stone Subjected to Foot Traffic Using a Rotary Platform, Double-Head Abraser

D1204-14(2020).....Test Method for Linear Dimensional Changes of Nonrigid Thermoplastic Sheeting or Film at Elevated Temperature

D2240-15e1.....Test Method for Rubber Property – Durometer Hardness

D2497-07(2018).....Tolerances for Manufactured Organic-Base Filament Single Yarns

D3045-2018.....Heat Aging of Plastics Without Load

D4397-23.....Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

D5109-12(Withdrawn2020).Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards (recommend deletion)

D. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

E. Marble Institute of America (MIA)/ Building Stone Institute (BSI):

Dimension Stone Design Manual VIII-2016

F. Tile Council of North America, Inc. (TCNA):

Handbook for Ceramic Tile Installation (2020)G. TCNA DCOF AcuTest-2012,Dynamic Coefficient of Friction Test

PART 2 - PRODUCTS

2.1 TILE

A. Comply with ANSI A137.1, Standard Grade, except as modified:
   1. Inspection procedures listed under the Appendix of ANSI A137.1.
   2. Abrasion Resistance Classification:
      a. Tested in accordance with values listed in Table 1, ASTM C1027.
      b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
      c. Class IV, 6000 revolutions for remaining areas.
   3. Mosaic tile may be mounted or joined by a resinous bonding material along tile edges.
   4. Factory Blending: For tile with color variations, within the ranges selected during sample submittals blend tile in the factory and package so tile units taken from one (1) package show the same range in colors as those taken from other packages and match approved samples.

   5. Factory-Applied Temporary Protective Coating:
      a. Protect exposed face surfaces (top surface) of tile against adherence of mortar and grout by pre-coating with a continuous film of hot applied petroleum paraffin wax.
      b. Do not coat unexposed tile surfaces.
      c. Pre-wax tiles set or grouted with furan or epoxy.

B. Glazed Wall Tile: Cushion edges, glazing.

C. Trim Shapes:
   1. Conform to applicable requirements of adjoining floor and wall tile.
   2. Use trim shapes sizes conforming to size of adjoining field wall tile including existing spaces unless detailed on construction documents or specified otherwise.
   3. Internal and External Corners:
      a. Square internal and external corner joints are not acceptable.
      b. External corners including edges: Use bullnose shapes.
      c. Internal corners: Use cove shapes.
      d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.

e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.

f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.

g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.

h. For unglazed ceramic mosaic and glazed wall tile installed in portland cement mortar setting bed, use cove and bullnose shapes as applicable. When ceramic mosaic wall and base tile is required, use C Series cove and bullnose shapes.

i. For unglazed ceramic mosaic and glazed wall tile installed in dry-set portland cement mortar, latex-portland cement mortar, and organic adhesive (thin set methods), use cove and surface bullnose shapes as applicable.

j. For quarry tile work, use cove and bullnose shapes as applicable.

2.2 BACKER UNITS

A. Cementitious Backer Units:

1. Use in showers or wet areas.
2. Conform to ASTM C1325; Type A.
3. Use in maximum lengths available to minimize end to end butt joints.

2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) wide. Tape with pressure sensitive adhesive backing will not be permitted.

B. Tape Embedding Material: Latex-portland cement mortar complying with ANSI A108.01.

C. Joint material, including reinforcing tape, and tape embedding material, are to be as specifically recommended by the backer unit manufacturer.

2.4 FASTENERS

A. Screws for Cementitious Backer Units.

1. Standard screws for gypsum board are not acceptable.
2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
3. ASTM C954 for steel 1 mm (0.033 inch) thick.

4. ASTM C1002 for steel framing less than 0.0329 inch thick.

B. Washers: Galvanized steel, 13 mm (1/2 inch) minimum diameter.

2.5 SETTING MATERIALS OR BOND COATS

A. Conform to TCNA Handbook for Ceramic Tile Installation.

B. Portland Cement Mortar: ANSI A108.02.

C. Latex-Portland Cement Mortar: ANSI A118.4.

1. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.4.
2. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.

D. Dry-Set Portland Cement Mortar: ANSI A118.1. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.1.

E. Organic Adhesives: ANSI A136.1, Type 1.

F. Chemical-Resistant Bond Coat:

1. Epoxy Resin Type: ANSI A118.3.
2. Furan Resin Type: ANSI A118.5.

G. Elastomeric Waterproofing Membrane and Bond Coat:

1. TCNA F122-14 (on ground concrete) and TCNA F112A-14 (above ground concrete).
2. ANSI A118.10.
3. One component polyurethane, liquid applied material having the following additional physical properties:
   a. Hardness: Shore "A" between 40-60.
   b. Elongation: Between 300-600 percent.
   c. Tensile strength: Between .27 - .41 Newton per square millimeter (40-60 pounds per square inch gauge).
   d. No volatile compounds (VOC).
4. Coal tar modified urethanes are not acceptable.

H. Waterproofing Isolation Membrane:

1. Sheet System TCNA F122-14 (on-ground concrete) and TCNA F122A-14 (above-ground concrete).

2. Composite sheet consisting of ASTM D5109, Type II, Grade I Chlorinated Polyethylene (CM) sheet reinforced on both sides with a non-woven polyester fiber.
3. Designed for use in wet areas as an isolation and positive waterproofing membranes for thin-set bonding of sheet to substrate and thin-set bonding of ceramic and porcelain tile or marble to sheet. Suited for both horizontal and vertical applications.
4. Conform to the following additional physical properties:

Property	Units	Results	Test Method
Hardness Shore A	Points	70-80	ASTM D2240 (10 Second Reading)
Shrinkage	Percent	5 maximum	ASTM D1204
Brittleness		No crack remains flexible at temperature -37 degrees C (-35 degrees F)	ASTM D2497 13 mm (1/2-inch) Mandrel Bend
Retention of Properties after Heat Aging	Percent of original	80 Tensile 80 Breaking 80 Elongation	ASTM D3045, 90 degrees C (194 degrees F) for 168 hours

5. Manufacturer’s standard sheet size with prefabricated or preformed inside and outside corners.
6. Sheet manufacturer’s solvent welding liquid or xylene and edge sealant.

2.6 GROUTING MATERIALS

A. Coloring Pigments:

1. Pure mineral pigments, lime proof and nonfading, complying with ASTM C979/C979M.
2. Coloring pigments may only be added to grout by the manufacturer.
3. Job colored grout is not acceptable.
4. Use is required in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.

B. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated. Zero VOC content.

C. Standard Cement Grout: ANSI A118.6.

D. High Performance Tile Grout: ANSI A118.7 with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) .

1. Polymer Type: Ethylene vinyl acetate or acrylic additive, in dry, redispersible form, prepackaged with other dry ingredients.

E. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59 (EPA Method 24) .

1. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to 60 and 100 degrees C (140 and 212 degrees F), respectively, and certified by manufacturer for intended use.

2.7 PATCHING AND LEVELING COMPOUND

A. Portland cement base, polymer-modified, self-leveling compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

B. Provide a patching and leveling compound with the following minimum physical properties:

1. Compressive strength - 25 MPa (3500 psig) per ASTM C109/C109M.
2. Flexural strength - 7 MPa (1000 psig) per ASTM C348 (28 day value).
3. Tensile strength – 4.1 MPa (600 psi) per ANSI 118.7.
4. Density – 1.9.

C. Capable of being applied in layers up to 38 mm (1-1/2 inches) thick without fillers and up to 101 mm (4 inches) thick with fillers, being brought to a feather edge, and being trowelled to a smooth finish.

D. Primers, fillers, and reinforcement as required by manufacturer for application and substrate condition.

E. Ready for use in 48 hours after application.

2.8 MARBLE

2.9 METAL DIVIDER STRIPS

A. Terrazzo type divider strips.

B. Heavy top type strip with 5 mm (3/16 inch) wide top and 38 mm (1 1/2 inch) long leg. Height to match tile and setting-bed thickness.

C. Embedded leg perforated and deformed for keying to mortar.

D. stainless-steel, ASTM A666, 300 Series exposed-edge material.

2.10 WATER

A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

2.11 CLEANING COMPOUNDS

A. Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

B. Materials containing acid or caustic Material are not acceptable.

2.12 FLOOR MORTAR BED REINFORCING

A. ASTM A1064/A1064M welded wire fabric without backing, MW3 x MW3 (2 x 2-W0.5 x W0.5).

2.13 POLYETHYLENE SHEET

A. Polyethylene sheet conforming to ASTM D4397.

B. Nominal thickness: 0.15 mm (6 mils).

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient temperature of work areas at not less than 16 degrees C (60 degrees F), without interruption, for not less than 24 hours before installation and not less than three (3) days after installation.

B. Maintain higher temperatures for a longer period of time where required by manufacturer's recommendation and ANSI Specifications for installation.

C. Do not install tile when the temperature is above 38 degrees C (100 degrees F).

D. Do not install materials when the temperature of the substrate is below 16 degrees C (60 degrees F).

E. Do not allow temperature to fall below 10 degrees C (50 degrees F) after third day of completion of tile work.

3.2 ALLOWABLE TOLERANCE

A. Variation in plane of sub-floor, including concrete fills leveling compounds and mortar beds:
   1. Not more than 6 mm in 3048 mm (1/4 inch in 10 feet) from required elevation where portland cement mortar setting bed is used.
   2. Not more than 3 mm in 3048 mm (1/8 inch in 10 feet) where dry-set portland cement, and latex-portland cement mortar setting beds and chemical-resistant bond coats are used.

B. Variation in Plane of Wall Surfaces:
   1. Not more than 6 mm in 2438 mm (1/4 inch in 8 feet) from required plane where portland cement mortar setting bed is used.
   2. Not more than 3 mm in 2438 mm (1/8 inch in 8 feet) where dry-set or latex-portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION

A. Cleaning New Concrete or Masonry:
   1. Chip out loose material, clean off all oil, grease dirt, adhesives, curing compounds, and other deterrents to bonding by mechanical method, or by using products specifically designed for cleaning concrete and masonry.
   2. Use self-contained power blast cleaning systems to remove curing compounds and steel trowel finish from concrete slabs where ceramic tile will be installed directly on concrete surface with thin-set materials.
   3. Steam cleaning or the use of acids and solvents for cleaning will not be permitted.

B. Patching and Leveling:
   1. Mix and apply patching and leveling compound in accordance with manufacturer's instructions.
   2. Fill holes and cracks and align concrete floors that are out of required plane with patching and leveling compound.
      a. Thickness of compound as required to bring finish tile system to elevation shown on construction documents.
      b. Float finish.

c. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

3. Apply patching and leveling compound to concrete and masonry wall surfaces that are out of required plane.
4. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.

C. Mortar Bed for Slopes to Drains:
1. Slope compound to drain where drains are shown on construction documents.
2. Install mortar bed in depressed slab sloped to drains not less than 3.2 mm in 305 mm (1/8 inch per foot).
3. Allow not less than 50 mm (2 inch) depression at edge of depressed slab.
4. Screed for slope to drain and float finish.
5. Cure mortar bed for not less than seven (7) days. Do not use curing compounds or coatings.
6. Perform flood test to verify mortar bed slopes to drain before installing tile. Contracting Officer Representative (COR) to be present during flood test.

D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin is to be in accordance with the manufacturer's printed instructions.

E. Cleavage Membrane:
1. Install polythene sheet as cleavage membrane in depressed slab when waterproof membrane is not scheduled or indicated.
2. Turn up at edge of depressed floor slab to top of floor.

F. Walls:
1. In showers or other wet areas cover studs with polyethylene sheet.
2. Apply patching and leveling compound to concrete and masonry surfaces that are out of required plane.
3. Apply leveling coats of material compatible with wall surface and tile setting material to wall surfaces, other than concrete and masonry that are out of required plane.
4. Apply metal lath to framing in accordance with ANSI A108.1:

a. Use fasteners specified in paragraph "Fasteners." Use washers when lath opening is larger than screw head.
b. Apply scratch and leveling coats to metal lath in accordance with ANSI A108.1C.
c. Total thickness of scratch and leveling coats:
   1) Apply 9 mm to 16 mm (3/8 inch to 5/8 inch) thick over solid backing.
   2) 16 mm to 19 mm (5/8 to 3/4 inch) thick on metal lath over studs.
   3) Where wainscots are required to finish flush with wall surface above, adjust thickness required for flush finish.
d. Apply scratch and leveling coats more than 19 mm (3/4 inch) thick in two (2) coats.

G. Existing Floors and Walls:
1. Remove existing composition floor finishes and adhesive. Prepare surface by grinding, chipping, self-contained power blast cleaning or other suitable mechanical methods to completely expose uncontaminated concrete or masonry surfaces. Follow safety requirements of ANSI A10.20.
2. Remove existing concrete fill or topping to structural slab. Clean and level the substrate for new setting bed and waterproof membrane or cleavage membrane.
3. Where new tile bases are required to finish flush with plaster above or where they are extensions of similar bases in conjunction with existing floor tiles, cut channel in floor slab and expose rough wall construction sufficiently to accommodate new tile base and setting material.

3.4 CEMENTITIOUS BACKER UNITS

A. Remove polyethylene wrapping from cementitious backer units and separate to allow for air circulation. Allow moisture content of backer units to dry down to a maximum of 35 percent before applying joint treatment and tile.
B. Install in accordance with ANSI A118.9 except as specified otherwise.

C. Install units horizontally or vertically to minimize joints with end joints over framing members. Units with rounded edges; face rounded edge away from studs to form a "V" joint for joint treatment.

D. Secure cementitious backer units to each framing member with screws spaced not more than 203 mm (8 inches) on center and not closer than 13 mm (1/2 inch) from the edge of the backer unit or as recommended by backer unit manufacturer. Install screws so that the screw heads are flush with the surface of the backer unit.

E. Where backer unit joins shower pans or waterproofing, lap backer unit over turned up waterproof system. Install fasteners only through top one-inch of turned up waterproof systems.

F. Do not install joint treatment for seven (7) days after installation of cementitious backer unit.

G. Joint Treatment:

1. Fill horizontal and vertical joints and corners with latex-portland cement mortar. Apply fiberglass tape over joints and corners and embed with same mortar.
2. Leave 6 mm (1/4 inch) space for sealant at lips of tubs, sinks, or other plumbing receptors.

3.5 GLASS MAT WATER-RESISTANT BACKING BOARD

3.6 MARBLE

3.7 METAL DIVIDER STRIPS

A. Install metal divider strips in floor joints between ceramic and quarry tile floors and between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise on construction documents.

B. Set divider strip in mortar bed to line and level centered under doors or in openings.

C. At preformed sealant joint: Refer to Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.

1. Comply with recommendations in TCNA for Vertical and Horizontal Joint Design Essentials. TCNA Systems EJ 171.
   a. Locate joint in tile surfaces directly above joint in sub-floor or where indicated when used with isolation membranes to allow off-setting of joint location from sub-floor joint.
   b. Fasten full length to sub-floor using a construction adhesive.

c. Trowel setting material with full coverage over the entire leg.

2. Set tile up against the joint ensuring that the top edge of the joint is flush or slightly below the top of the tile.

3.8 CERAMIC TILE – GENERAL

A. Comply with ANSI A108/A118/A136 series of tile installation standards applicable to methods of installation and TCNA Installation Guidelines.

B. Installing Mortar Beds for Floors:

1. Install mortar bed in a manner that does not damage cleavage or waterproof membrane; 32 mm (1-1/2 inch) minimum thickness.
2. Install floor mortar bed reinforcing centered in mortar fill.
3. Screed finish to level plane or slope to drains shown on construction documents, float finish.
4. For thin set systems cure mortar bed not less than seven (7) days. Do not use curing compounds or coatings.
5. For tile set with portland cement paste over plastic mortar bed coordinate to set tile before mortar bed sets.

C. Setting Beds or Bond Coats:

1. Where recessed or depressed floor slabs are filled with portland cement mortar bed, set ceramic mosaic floor tile in either portland cement paste over plastic mortar bed or latex-portland cement mortar over cured mortar bed except as specified otherwise, ANSI A108-1C, TCNA System F121-14 or F111-14.
2. Use quarry tile in chemical-resistant bond coat.
   a. Portland cement paste over plastic mortar bed. ANSI A108.1A.
   b. Dry-set portland cement mortar over cured mortar bed. ANSI A108.1B.
3. Pools Holding Water: ANSI A108.1C. Do not use latex portland cement mortar.
4. Set floor tile in elastomeric bond coat over elastomeric membrane per ANSI 108.13, TCNA System F122-14 where indicated on construction documents.
5. Set wall tile installed over concrete or masonry in dry-set portland cement mortar, or latex-portland cement mortar, ANSI 108.1B and TCNA System W211-14, W221-14 or W222-14.

6. Set wall tile installed over concrete backer board in latex-portland cement mortar, ANSI A108.1B.
7. Set wall tile installed over portland cement mortar bed on metal lath base in portland cement paste over plastic mortar bed, or dry-set portland cement mortar or latex-portland cement mortar over a cured mortar bed, ANSI A108.1C, TCNA System W231-14, W241-14.
8. Set tile over concrete in therapeutic pools in portland cement paste or dry set portland cement mortar, ANSI A108.1C, TCNA System P601MB-14.
9. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.1, TCNA System W242-14.
10. Set trim shapes in same material specified for setting adjoining tile.

D. Workmanship:

1. Lay out tile work so that no tile less than one-half full size is used. Make all cuts on the outer edge of the field.
2. Set tile firmly in place with finish surfaces in true planes. Align tile flush with adjacent tile unless shown otherwise on construction documents.
3. Form intersections and returns accurately.
4. Cut and drill tile neatly without marring surface.
5. Cut edges of tile abutting penetrations, finish, or built-in items:
   a. Fit tile closely around electrical outlets, piping, fixtures and fittings, so that plates, escutcheons, collars and flanges will overlap cut edge of tile.
   b. Seal tile joints water tight as specified in Section 07 92 00, JOINT SEALANTS, around electrical outlets, piping fixtures and fittings before cover plates and escutcheons are set in place.
6. Completed work is to be free from hollow sounding areas and loose, cracked or defective tile.
7. Remove and reset tiles that are out of plane or misaligned.
8. Floors:
   a. Extend floor tile beneath casework and equipment, except those units mounted in wall recesses.

b. Align finish surface of new tile work flush with other and existing adjoining floor finish where indicated in construction documents.
c. In areas where floor drains occur, slope tile to drains.
d. Push and vibrate tiles over 203 mm (8 inches) square to achieve full support of bond coat.

9. Walls:
   a. Cover walls and partitions, including pilasters, furred areas, and freestanding columns from floor to ceiling, or from floor to nominal wainscot heights as indicated in construction documents with tile.
   b. Finish reveals of openings with tile, except where other finish materials are indicated in construction documents.
   c. Finish wall surfaces behind and at sides of casework and equipment, except those units mounted in wall recesses, with same tile as scheduled for room proper.
10. Joints:
   a. Keep all joints in line, straight, level, perpendicular and of even width unless shown otherwise on construction documents.
   b. Make joints 2 mm (1/16 inch) wide for glazed wall tile and mosaic tile work.
   c. Make joints in quarry tile work not less than 6 mm (1/4 inch) nor more than 9 mm (3/8 inch) wide. Finish joints flush with surface of tile.
   d. Make joints in paver tile, porcelain type; maximum 3 mm (1/8 inch) wide.
11. Back Buttering: For installations indicated below, obtain 100 percent mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108/A118/A136 series of tile installation standards:
   a. Tile wall installations in wet areas, including showers, tub enclosures, laundries and swimming pools.
   b. Tile installed with chemical-resistant mortars and grouts.
   c. Tile wall installations composed of tiles 203 by 203 mm (8 by 8 inches) or larger.
   d. Exterior tile wall installations.

3.9 CERAMIC TILE INSTALLED WITH PORTLAND CEMENT MORTAR

A. Mortar Mixes for Floor, Wall and Base Tile: ANSI A108.1A. except specified otherwise.
B. Installing Wall and Base Tile: ANSI A108.1A, except specified otherwise.
C. Installing Floor Tile: ANSI A108.1A, except as specified otherwise. Slope mortar beds to floor drains at a minimum of 3 mm in 305 mm (1/8 inch per foot).

3.10 PORCELAIN TILE INSTALLED WITH LATEX PORTLAND CEMENT BONDING MORTAR

A. Due to the denseness of porcelain tile use latex portland cement bonding mortar that meets the requirements of ANSI A108.01. Mix bonding mortars in accordance with manufacturer’s instructions. Provide liquid ratios and comply with dwell times during the placement of bonding mortar and tile.

3.11 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR

A. Installation of Tile: ANSI A108.1B, except as specified otherwise.
B. Slope tile work to drains at not less than 3 mm in 305 mm (1/8 inch per foot).

3.12 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH ORGANIC ADHESIVE

A. Installation of Tile: ANSI A108.4.

3.13 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH CHEMICAL-RESISTANT BOND COAT

A. Epoxy Resin Type: Install tile in accordance with Installation of Tile with Epoxy Mortar; ANSI A108.6.
B. Furan Resin Type: Proportion, mix and place in accordance with the manufacturer's printed instructions. Set tile in accordance with ANSI A108.8.

3.14 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT

A. Surface Preparation: Prepare surfaces as specified.
B. Installation of Elastomeric Membrane: ANSI A108.10 and TCNA F122-14 (on ground concrete) and F122A-14 (above-ground concrete).
   1. Prime surfaces, where required, in accordance with manufacturer's instructions.

2. Install first coat of membrane material in accordance with manufacturer's instructions, in thickness of 0.76 to 1.3 mm (30 to 50 mils).
3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 101 mm (4 inches) above finish floor surface.
4. When material has set, recoat areas with a second coat of elastomeric membrane material for a total thickness of 1.3 to 1.9 mm (50 to 75 mils).
5. After curing test for leaks with 25 mm (1 inch) of water for 24 hours.

C. Installation of Tile in Elastomeric Membrane:
1. Spread no more material than can be covered with tile before material starts to set.
2. Apply tile in second coat of elastomeric membrane material in accordance with the coating manufacturer's instructions in lieu at aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

3.15 GROUTING

A. Grout Type and Location:
1. Grout for glazed wall and base tile, paver tile and unglazed mosaic tile portland cement grout, latex-portland cement grout, dry-set grout, or commercial portland cement grout.

2. Grout for quarry tile floor and base:
a. Grout for floors of walk-in refrigerated rooms: Epoxy grout.
b. Therapeutic pool areas: Portland cement grout.
c. Grout for Kitchens:
1) Chemical-resistant grout as specified and recommended by manufacturer of bond coat.
2) Use only furan resin grout within 609 mm (2 feet) of ovens, steam kettles, water heaters, steam pipes, and in rooms.
3) Epoxy grout designed for equivalent heat resistance to furan resin grout may be used for furan resin grout.
3. Grout for tile of therapeutic pools: Portland cement grout.

B. Workmanship:
1. Install and cure grout in accordance with the applicable standard.

2. Sand Portland Cement Grout: ANSI A108.10.
3. Standard Cement Grout: ANSI A118.6.
4. High Performance Grout: ANSI A118.7.
5. Epoxy Grout: ANSI A108.6.
6. Water-Cleanable Epoxy Grout: ANSI A118.3.
7. Furan and Commercial Portland Cement Grout: ANSI A118.5 and in accordance with the manufacturer's printed instructions.

3.16 MOVEMENT JOINTS

A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.

B. TCNA details EJ 171-14.

C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.

3.17 CLEANING:

A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.

B. Methods and materials used are not permitted to damage or impair appearance of tile surfaces.

C. The use of acid or acid cleaners on glazed tile surfaces is prohibited.

D. Clean tile grouted with epoxy, furan and commercial portland cement grout and tile set in elastomeric bond coat as recommended by the manufacturer of the grout and bond coat.

3.18 PROTECTION

A. Keep traffic off tile floor, until grout and setting material is fully set and cured.

B. Where traffic occurs over tile floor is unavoidable, cover tile floor with not less than 9 mm (3/8 inch) thick plywood, wood particle board, or hardboard securely taped in place. Do not remove protective cover until time for final inspection. Clean tile of any tape, adhesive and stains.

3.19 TESTING FINISH FLOOR

A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

B. Test kitchen and storage rooms.

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12-01-18

SECTION 09 51 00
ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Acoustical units.
   2. Metal ceiling suspension system for acoustical ceilings.

1.2 RELATED REQUIREMENTS

A. Adhesive VOC Limits: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.
B. Color, pattern, and location of each type of acoustical unit: as shown on drawings
C. Access doors in adhesive applied tile: Section 08 31 13, ACCESS DOORS AND FRAMES.
D. Ceiling Suspension System: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
E. Lay in gypsum board ceiling panels: Section 09 29 00, GYPSUM BOARD.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.
B. ASTM International (ASTM):
   1. A641/A641M-19 - Zinc-coated (Galvanized) Carbon Steel Wire.
   2. A653/A653M-23 - Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process.
   3. C423-23 - Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
   4. C634-22 - Terminology Relating to Environmental Acoustics.
   5. C635/C635M-22 - Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   6. C636/C636M-19 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   7. D1779-17 - Adhesive for Acoustical Materials.
   8. E84-23 - Surface Burning Characteristics of Building Materials.
   9. E119-22 - Fire Tests of Building Construction and Materials.
   10. E413-22 - Classification for Rating Sound Insulation.

11. E580/E580M-22 - Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
12. E1264-23 - Classification for Acoustical Ceiling Products.

C. International Organization for Standardization (ISO):
1. ISO 14644-1 - Classification of Air Cleanliness.

1.4 PREINSTALLATION MEETINGS

A. Conduct preinstallation meeting at project site minimum 30 days before beginning Work of this section.
1. Required Participants:
a. Contracting Officer's Representative.
b. VA Interior Designer.
c. Contractor.
d. Installer.
e. Other installers responsible for adjacent and intersecting work, including sprinkler HVAC and lighting installers.
2. Meeting Agenda: Distribute agenda to participants minimum 3 days before meeting.
a. Installation schedule.
b. Installation sequence.
c. Preparatory work.
d. Protection before, during, and after installation.
e. Installation.
f. Terminations.
g. Transitions and connections to other work.
h. Inspecting and testing.
i. Other items affecting successful completion.
3. Document and distribute meeting minutes to participants to record decisions affecting installation.

1.5 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:
1. Show size, configuration, and fabrication and installation details.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Ceiling suspension system indicating manufacturer recommendation for each application.
3. Installation instructions.
4. Warranty.

D. Samples:
1. Acoustical units, 150 mm (6 inches) in size, each type,
a. Submit quantity required to show full color and texture range.
2. Suspension system, trim and molding, 300 mm (12 inches) long.
3. Colored markers for access service.
4. Approved samples may be incorporated into work.

E. Sustainable Construction Submittals:
1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
2. Biobased Content:
a. Show type and quantity for each product.
b. Show volatile organic compound types and quantities.

F. Certificates: Certify each product complies with specifications.
1. Acoustical units, each type.

G. Qualifications: Substantiate qualifications comply with specifications.
1. Manufacturer with project experience list.

H. Operation and Maintenance Data:
1. Care instructions for each exposed finish product.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Regularly manufactures specified products.
2. Manufactured specified products with satisfactory service on five similar installations for minimum five years.
a. Project Experience List: Provide contact names and addresses for completed projects.

1.7 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.8 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight conditioned facility.

B. Protect products from damage during handling and construction operations.

1.9 FIELD CONDITIONS

A. Environment:

1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
2. Work Area Ambient Conditions: HVAC systems are complete, operational, and maintaining facility design operating conditions continuously, beginning 48 hours before installation until Government occupancy.
3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.10 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Ceiling System: Acoustical ceilings units on exposed grid suspension systems.

2.2 SYSTEM PERFORMANCE

A. Design product complying with specified performance:

1. Maximum Deflection: 1/360of span, maximum.

B. Surface Burning Characteristics: When tested according to ASTM E84.

1. Flame Spread Rating: 25 maximum.
2. Smoke Developed Rating: 450 maximum.

2.3 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide acoustical units from one manufacturer.

1. Provide each product exposed to view from one production run.

C. Provide suspension system from same manufacturer.

D. Sustainable Construction Requirements:

1. Mineral Base Recycled Content: 65 percent, total recycled content, minimum. Select products with recycled content to achieve overall Project recycled content requirement.
2. Steel Recycled Content: 30 percent total recycled content, minimum.
3. Aluminum Recycled Content: 80 percent total recycled content, minimum.
4. Biobased Content: 37 percent by weight biobased material, minimum.
5. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Non-flooring adhesives and sealants.

2.4 ACOUSTICAL UNITS

A. General:

1. Ceiling Panel and Tile: ASTM E1264, bio-based content according to USDA Bio-Preferred Product requirements.
   a. Mineral Fiber: 3.6 kg/sq. m (3/4 psf) weight, minimum.
2. Classification: Provide type and form as follows:
   a. Type III Units - Mineral base with water-based painted finish maximum 10 g/l VOC; Form 2 - Water felted, minimum 16 mm (5/8 inch) thick.
   b. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply poly (vinyl) chloride over paint coat.
   c. Type V Units - Perforated steel facing (pan) with mineral or glass fiber base backing.
      1) Steel: Galvanized steel, ASTM A653, with G30 coating. minimum 0.38 mm (0.015 inch) thick.
      2) Bonderize both sides. Apply two coats of baked-on enamel finish on surfaces exposed to view and one coat on concealed surfaces.

d. Type VI Units - Perforated stainless steel facing (pan) with mineral or glass fiber base backing.

e. Type VII Units - Perforated aluminum facing (pan) with mineral or glass fiber base backing.

1) Aluminum sheets, minimum 0.635 mm (0.025 inch) thick.

2) Apply two coats of baked-on enamel finish, free from gloss or sheen, on face and flanges.

f. NRC (Noise Reduction Coefficient): ASTM C423, minimum 0.55 unless specified otherwise.

g. CAC (Ceiling Attenuation Class): ASTM E413, 40-44 range unless specified otherwise.

h. LR (Light Reflectance): Minimum 0.75.

3. Lay-in panels: Sizes as indicated on Drawings, with square edges.

a. Sizes:

1) Cross Score: 300 by 600 mm (12 by 24 inch) tile to simulate 300 by 300 mm (12 by 12 inch) tile edges.

2) Edge and Joint Detail: Square edges and joints as required to suit suspension and access system.

2.5 METAL SUSPENSION SYSTEM

A. General: ASTM C635, intermediate-duty , except as otherwise specified.

1. Suspension System: Provide the following:

a. Galvanized cold-rolled steel, bonderized.

2. Main and Cross Runner: Use same construction Do not use lighter-duty sections for cross runners.

B. Exposed Grid Suspension System: Support of lay-in panels.

1. Grid Width: 22 mm (7/8 inch) minimum with8 mm (5/16 inch) minimum panel bearing surface.

2. Molding: Fabricate from the same material with same exposed width and finish.

3. Finish: Baked-on enamel flat texture finish.

a. Color: To match adjacent acoustical units unless specified otherwise in drawings.

C. Suspension System Support of Metal Type V, VI, and VII Tiles: Concealed grid type with runners for snap-in attachment of metal tile (pans).

D. Carrying Channels Secondary Framing: Cold-rolled or hot-rolled steel, black asphaltic paint finish, rust free.

1. Weight per 300 m (per thousand linear feet), minimum:

Size		Cold-rolled		Hot-rolled	
mm	inches	kg	pound	kg	pound
38	1-1/2	215.4	475	508	1120
50	2	267.6	590	571.5	1260

E. Anchors and Inserts: Provide anchors or inserts to support twice the loads imposed by hangers.

1. Hanger Inserts: Steel, zinc-coated (galvanized after fabrication).
   a. Nailing type option for wood forms:
      1) Upper portion designed for anchorage in concrete and positioning lower portion below surface of concrete approximately 25 mm (one inch).
      2) Lower portion provided with minimum 8 mm (5/16 inch) hole to permit attachment of hangers.
   b. Flush ceiling insert type:
      1) Designed to provide a shell covered opening over a wire loop to permit attachment of hangers and keep concrete out of insert recess.
      2) Insert opening inside shell approximately 16 mm (5/8 inch) wide by 9 mm (3/8 inch) high over top of wire.
      3) Wire 5 mm (3/16 inch) diameter with length to provide positive hooked anchorage in concrete.

F. Clips: Galvanized steel, designed to secure framing member in place.

G. Tile Splines: ASTM C635.

H. Wire: ASTM A641.

1. Size:
   a. Wire Hangers: Minimum diameter 2.68 mm (0.1055 inch).
   b. Bracing Wires: Minimum diameter 3.43 mm (0.1350 inch).

2.6 ACCESSORIES

A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

B. Perimeter Seal: Vinyl, polyethylene or polyurethane open cell sponge material, density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
   1. Thickness: As required to fill voids between back of wall molding and finish wall.
   2. Size: Minimum 9 mm (3/8 inch) wide strip.

C. Access Identification Markers: Colored markers with pressure sensitive adhesive on one side, paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) diameter.
   1. Color Code: Provide the following color markers for service identification:

Color	Service
Red	Sprinkler System: Valves and Controls
Green	Domestic Water: Valves and Controls
Yellow	Chilled Water and Heating Water
Orange	Ductwork: Fire Dampers
Blue	Ductwork: Dampers and Controls
Black	Gas: Laboratory, Medical, Air and Vacuum

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing acoustical panels suspension system to permit new installation.
   1. Retain existing acoustical panels suspension system for reuse.
   2. Dispose of other removed materials.

3.2 INSTALLATION - GENERAL

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.

3.3 ACOUSTICAL UNIT INSTALLATION

A. Applications:
   1. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.

B. Layout acoustical unit symmetrically, with minimum number of joints.

C. Installation:
   1. Install acoustic tiles after wet finishes have been installed and solvents have cured.
   2. Install lay-in acoustic panels in exposed grid with minimum 6 mm (1/4 inch) bearing at edges on supports.
      a. Install tile to lay level and in full contact with exposed grid.
      b. Replace cracked, broken, stained, dirty, or tile.
   3. Tile in concealed grid upward access suspension system:
      a. Install acoustical tile with joints close, straight and true to line, and with exposed surfaces level and flush at joints.
      b. Make corners and arises full, and without worn or broken places.
      c. Locate acoustical units providing access to service systems.
   4. Adhesive applied tile:
      a. Condition of surface according to ASTM D1779, Note 1, Cleanliness of Surface, and Note 4, Rigidity of Base Surface.
      b. Size or seal surface as recommended by manufacturer of adhesive and allow to dry before installing units.
   5. Markers:
      a. Install color coded markers to identify the various concealed piping, mechanical, and plumbing systems.
      b. Attach colored markers to exposed grid on opposite sides of the units providing access.
      c. Attach marker on exposed ceiling surface of upward access acoustical unit.

D. Touch up damaged factory finishes.
   1. Repair painted surfaces with touch up primer.

3.4 CEILING SUSPENSION SYSTEM INSTALLATION

A. General: Install according to ASTM C636.
   1. Use direct or indirect hung suspension system or combination of both.

2. Support a maximum area of 1.48 sq. m (16 sq. ft.) of ceiling per hanger.
3. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
4. Provide additional hangers located at each corner of support components.
5. Provide minimum 100 mm (4 inch) clearance from the exposed face of the acoustical units to the underside of ducts, pipe, conduit, secondary suspension channels, concrete beams or joists; and steel beam or bar joist unless furred system is shown.
6. Provide main runners minimum 1200 mm (48 inches) in length.
7. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.

B. Direct Hung Suspension System: ASTM C635.
   1. Support main runners by hanger wires attached directly to the structure overhead.
   2. Maximum spacing of hangers, 1200 mm (4 feet) on centers unless interference occurs by mechanical systems. Use indirect hung suspension system where not possible to maintain hanger spacing.

C. Anchorage to Structure:
   1. Concrete:
      a. Install hanger inserts and wire loops required for support of hanger and bracing wire. Install hanger wires with looped ends through steel deck when steel deck does not have attachment device.
      b. Use eye pins or threaded studs with screw-on eyes in existing or already placed concrete structures to support hanger and bracing wire. Install in sides of concrete beams or joists at mid height.
   2. Steel:
      a. Install carrying channels for attachment of hanger wires.
         1) Size and space carrying channels to support load within performance limit.
         2) Attach hangers to steel carrying channels, spaced four feet on center, unless area supported or deflection exceeds the amount specified.

b. Attach carrying channels to the bottom flange of steel beams spaced not 1200 mm (4 feet) on center before fireproofing is installed. Weld or use steel clips for beam attachment.

c. Attach hangers to bottom chord of bar joists or to carrying channels installed between the bar joists when hanger spacing prevents anchorage to joist. Rest carrying channels on top of the bottom chord of the bar joists, and securely wire tie or clip to joist.

D. Seismic Ceiling Bracing System:

1. Install according to ASTM E580.
2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels of suspended ceiling at bottom.

3.5 CEILING TREATMENT

A. Moldings:

1. Install metal wall molding at perimeter of room, column, or edge at vertical surfaces.
2. Install special shaped molding at changes in ceiling heights and at other breaks in ceiling construction to support acoustical units and to conceal their edges.

B. Perimeter Seal:

1. Install perimeter seal between vertical leg of wall molding and finish wall, partition, and other vertical surfaces.
2. Install perimeter seal to finish flush with exposed faces of horizontal legs of wall molding.

C. Existing ceiling:

1. Where extension of existing ceilings occurs, match existing.
2. Where acoustical units are salvaged and reinstalled or joined, use salvaged units within a space. Do not mix new and salvaged units within a space which results in contrast between old and new acoustic units.
3. Comply with specifications for new acoustical units for new units required to match appearance of existing units.

3.6 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed surfaces. Remove contaminants and stains.

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SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Resilient base (RB) adhered to interior walls and partitions.
2. Sheet rubber flooring (SRF) adhered to interior stair landings.

1.2 RELATED REQUIREMENTS

A. Sheet Flooring Integral Base: Section 09 65 16, RESILIENT SHEET FLOORING.

B. Rubber Tile Flooring at Landings: Section 09 65 19, RESILIENT TILE FLOORING.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. ASTM International (ASTM):

F1344-21a.....Rubber Floor Tile.
F1859-21a.....Rubber Sheet Floor Covering without Backing.
F1860-21a.....Rubber Sheet Floor Covering with Backing.
F1861-21.....Resilient Wall Base.
D4259-18.....Preparation of Concrete by Abrasion Prior to Coating Application.

C. Federal Specifications (Fed. Spec.):

RR-T-650E (1994).....Treads, Metallic and Non-Metallic, Skid-Resistant.

D. International Concrete Repair Institute (ICRI):

310.2R-2013.....Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Manufacturer's Literature and Data:

1. Description of each product.
2. Adhesives and primers indicating manufacturer's recommendation for each application.
3. Installation instructions.

C. Samples:
   1. Resilient Base: 150 mm (6 inches) long, each type and color.
   2. Sheet Rubber Flooring: 300 mm (12 inches) square, each type and color.

D. Sustainable Construction Submittals:

   1. Recycled Content: Identify post-consumer and pre-consumer recycled content percentage by weight.
   2. Low Pollutant-Emitting Materials:
      a. Stair Treads and Sheet Rubber Flooring: Submit Floor Score label.
      b. Show volatile organic compound types and quantities.

E. Operation and Maintenance Data:
   1. Care instructions for each exposed finish product.

1.5 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.6 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage when handling and during construction operations.

1.7 FIELD CONDITIONS

A. Environment:
   1. Product Temperature: Minimum 21 degrees C (70 degrees F) for minimum 48 hours before installation.
   2. Work Area Ambient Temperature Range: 21 to 27 degrees C (70 to 80 degrees F) continuously, beginning 48 hours before installation.
   3. Install products when building is permanently enclosed and when wet construction is completed, dried, and cured.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Basis of Design: as shown on drawings.

B. Provide each product from one manufacturer and from one production run.

C. Provide resilient stair treads and sheet rubber flooring from same manufacturer.

D. Sustainable Construction Requirements:

1. Sheet Rubber Flooring Recycled Content: 90 percent total recycled content, minimum.

2. Low Pollutant-Emitting Materials: Comply with VOC limits specified in Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS for the following products:
   a. Flooring Adhesives and Sealants.

2.2 RESILIENT BASE

A. Resilient Base: 3 mm (1/8 inch) thick, 100 mm (4 inches) high.

1. Type: Rubber or vinyl; use one type throughout.
2. ASTM F1861, Type TP thermoplastic rubber or Type TV thermoplastic vinyl, Group 2 - layered.

B. Applications:

1. Carpet Flooring Locations: Style A - Straight.
2. Other Locations: Style B - Cove.

2.3 RESILIENT STAIR TREADS

2.4 SHEET RUBBER FLOORING

A. Sheet Rubber Flooring (SRF): ASTM F1859 or ASTM F1860; Rubber, 900 mm (36 inches) wide, 3 mm (1/8 inch) thick, smooth face; color and pattern matching resilient stair treads.

2.5 PRIMER (FOR CONCRETE FLOORS)

A. Primer: Type recommended by adhesive manufacturer.

2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)

A. Leveling Compound: Provide products mixed with latex or polyvinyl acetate resins.

2.7 ADHESIVES

A. Adhesives: Low pollutant-emitting, water based type recommended by adhered product manufacturer for each application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.

B. Protect existing construction and completed work from damage.

C. Remove existing base to permit new installation.

1. Dispose of removed materials.

D. Correct substrate deficiencies.

1. Fill cracks, pits, and depressions with leveling compound.
2. Remove protrusions; grind high spots.
3. Apply leveling compound to achieve 3 mm (1/8 inch) in 3 m (10 feet) maximum surface variation.

E. Clean substrates. Remove contaminants capable of affecting subsequently installed product's performance.

1. Mechanically clean concrete floor substrate according to ASTM D4259.
2. Surface Profile: ICRI Guideline No. 310.2R.

F. Allow substrate to dry and cure.

G. Perform flooring manufacturer’s recommended bond, substrate moisture content, and pH tests.

3.2 INSTALLATION GENERAL

A. Install products according to manufacturer's instructions.

1. When instructions deviate from specifications, submit proposed resolution for Contracting Officer consideration.

3.3 RESILIENT BASE INSTALLATION

A. Applications:

1. Install resilient base in rooms scheduled on Drawings.
2. Install resilient base on casework and locker toe spaces, and other curb supported fixed equipment.
3. Extend resilient base into closets, alcoves, and cabinet knee spaces, and around columns within scheduled room.

B. Lay out resilient base with minimum number of joints.

1. Length: 600 mm (24 inches) minimum, each piece.
2. Locate joints 150 mm (6 inches) minimum from corners and intersection of adjacent materials.

C. Installation:
   1. Apply adhesive uniformly for full contact between resilient base and substrate.
   2. Set resilient base with hairline butted joints aligned along top edge.

D. Factory form corners and end stops.
   1. V-groove back of outside corner.
   2. V-groove face of inside corner and notch cove for miter joint.

E. Roll resilient base ensuring complete adhesion.

3.4 RESILIENT STAIR TREAD INSTALLATION

3.5 SHEET RUBBER FLOORING INSTALLATION

A. Applications:
   1. Install sheet rubber flooring on intermediate and floor landings where resilient stair treads are installed.

B. Lay out sheet rubber flooring symmetrically, with minimum number of joints.
   1. Locate floor landing joints centered under doors.

C. Installation:
   1. Apply adhesive uniformly for full contact between sheet rubber flooring and substrate.
   2. Install sheet rubber flooring with 1 mm (0.04 inch) maximum width seams, perimeter joints, and joints with adjacent flooring.
      a. Scribe sheet rubber flooring tight to interrupting surfaces.
   3. Roll sheet rubber flooring ensuring complete adhesion.

3.6 CLEANING

A. Remove excess adhesive before adhesive sets.

B. Clean exposed resilient base, and sheet rubber flooring surfaces. Remove contaminants and stains.
   1. Clean with mild detergent. Leave surfaces free of detergent residue.

C. Polish exposed resilient base to gloss sheen.

3.7 PROTECTION

A. Prohibit traffic on sheet rubber flooring 72 hours, minimum, after installation.

B. Protect products from construction traffic and operations.

1. Cover sheet rubber flooring with reinforced kraft paper, and plywood or hardboard.
2. Maintain protection until directed by Contracting Officer's Representative.

C. Replace damaged products and re-clean.

1. Damaged Products include cut, gouged, scraped, torn, and unbonded products.

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05-01-18

SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section specifies the installation of luxury vinyl tile and accessories required for a complete installation.

1.2 RELATED WORK:

A. Sustainable Design Requirements: Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS.

B. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

C. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

E. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: as shown on drawings.

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 described in PART 2 - PRODUCTS.
2. Postconsumer and preconsumer recycled content as described in PART 2 - PRODUCTS.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Resilient material manufacturer’s recommendations for adhesives, underlayment, primers, and polish.
3. Application, installation and maintenance instructions.

D. Samples:

1. Tile: Each type, color, thickness and finish.
2. Edge Strips: Each type, color, thickness and finish.
3. Feature Strips: Each type, color, thickness and finish.

E. Shop Drawings:

1. Layout of patterns as shown on the construction documents.
2. Edge strip locations showing types and detail cross sections.

F. Test Reports:

1. Abrasion resistance: Depth of wear for each tile type and color and volume loss of tile, certified by independent laboratory. Tested per ASTM F510/F510M.
2. Moisture and pH test results as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1.4 DELIVERY:

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.

B. Materials from containers which have been distorted, damaged or opened prior to installation are not acceptable.

1.5 STORAGE:

A. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives, and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

1.6 QUALITY ASSURANCE:

A. Installer Qualifications: A company specializing in installation with minimum three (3) years' experience and employs experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program.

1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
   a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
   b. Career long training.
   c. Manufacturer endorsed training.
   d. Fundamental journeyman skills certification.

C. Furnish product type materials from the same production run.

1.7 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

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. ASTM International (ASTM):

D2047-17.....Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine

D2240-15.....Test Method for Rubber Property—Durometer Hardness

D4078-02(R2021).....Water Emulsion Floor Finish

E648-23.....Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source

E662-21a.....Specific Optical Density of Smoke Generated by Solid Materials

E1155/E1155M-23.....Determining Floor Flatness and Floor Levelness Numbers

F510/F510M-20.....Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method

F710-22.....Preparing Concrete Floors to Receive Resilient Flooring

F925-13.....Test Method for Resistance to Chemicals of Resilient Flooring

F1344-20a.....Rubber Floor Tile

F1700-120.....Solid Vinyl Floor Tile

F1869-23.....Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170-19a.....Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes

F2195-18(2023).....Linoleum Floor Tile

C. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

D. International Standards and Training Alliance (INSTALL):

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS:

A. Provide adhesives, underlayment, primers, and polish recommended by resilient floor material manufacturer.

B. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.

C. Smoke Density: Less than 450 per ASTM E662.

D. Slip Resistance – Not less than 0.5 when tested with ASTM D2047.

2.2 RUBBER TILE:

2.3 LINOLEUM TILE:

2.4 SOLID VINYL-TILE:

2.5 LUXURY VINYL TILE:

A. ASTM F1700, Class III, Printed Film Vinyl Tile, Type A and B.

B. Thickness: 4.5mm

C. Size: 19x19, 9.8x39.

D. Provide products with recycled content with not less than 30 percent.

2.6 ADHESIVES:

A. Provide water resistant type adhesive for flooring, base and accessories as recommended by the manufacturer to suit substrate conditions. VOC content to be less than the 50 grams/L when calculated according to 40 CFR 59 (EPA Method 24). Submit manufacturer’s descriptive data, documentation stating physical characteristics, and mildew and germicidal characteristics.

2.7 PRIMER FOR CONCRETE SUBFLOORS:

A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.8 LEVELING COMPOUND FOR CONCRETE FLOORS:

A. Provide cementitious products with latex or polyvinyl acetate resins in the mix in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.9 POLISH AND CLEANERS:

A. Cleaners: As recommended in writing by floor tile manufacturer.

B. Polish: ASTM D4078.

2.10 MOULDING:

A. Provide tapered mouldings of vinyl and types as indicated on the construction documents for both edges and transitions of flooring materials specified. Provide vertical lip on moulding of maximum 6 mm (1/4 inch). Provide bevel change in level between 6 and 13 mm (1/4 and 1/2 inch) with a slope no greater than 1:2.

B. Fasteners for Aluminum Mouldings: Stainless steel of type required for substrate condition.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS:

A. Maintain flooring materials and areas to receive resilient flooring at a temperature above 20 degrees C (68 degrees F) for three (3) days before application, during application and two (2) days after application, unless otherwise directly by the flooring manufacturer for the flooring being installed. Maintain a minimum temperature of 13 degrees C (55 degrees F) thereafter. Provide adequate ventilation to remove moisture from area and to comply with regulations limiting concentrations of hazardous vapors.

B. Do not install flooring until building is permanently enclosed and wet construction in or near areas to receive tile materials is complete, dry and cured.

3.2 SUBFLOOR TESTING AND PREPARATION:

A. Prepare and test surfaces to receive resilient tile and adhesive as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

1. Remove existing resilient floor and existing adhesive.

B. Prepare concrete substrates in accordance with ASTM F710.

3.3 INSTALLATION:

A. Install in accordance with manufacturer's instructions for application and installation unless specified otherwise.

B. Mix tile from at least two containers. An apparent line either of shades or pattern variance is not acceptable.

C. Tile Layout:

1. If layout is not shown on construction documents, lay tile symmetrically about center of room or space with joints aligned.
2. Vary edge width as necessary to maintain full size tiles in the field, no edge tile to be less than 1/2 the field tile size, except where irregular shaped rooms make it impossible.
3. Place tile pattern in the same direction; do not alternate tiles unless specifically indicated in the construction documents to the contrary.

D. Application:

1. Adhere floor tile to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
2. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
3. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
4. Roll tile floor with a minimum 45 kg (100 pound) roller.

E. Seal joints at pipes with sealants in accordance with Section 07 92 00, JOINT SEALANTS.

F. Installation of Edge Strips:

1. Locate edge strips under center line of doors unless otherwise shown on construction documents.
2. Set resilient edge strips in adhesive. Anchor metal edge strips with anchors and screws.
3. Where tile edge is exposed, butt edge strip to touch along tile edge.
4. Where thin set ceramic tile abuts resilient tile, set edge strip against floor file and against the ceramic tile edge.

3.4 CLEANING AND PROTECTION:

A. Clean adhesive marks on exposed surfaces during the application of resilient materials before the adhesive sets. Exposed adhesive is not acceptable.

B. Keep traffic off resilient material for a minimum 72 hours after installation.

C. Clean flooring as recommended in accordance with manufacturer's printed maintenance instructions and within the recommended time frame. As required by the manufacturer, apply the recommended number of coats and type of polish and/or finish in accordance with manufacturer's written instructions.

D. When construction traffic occurs over tile, cover resilient materials with reinforced kraft paper properly secured and maintained until removal is directed by COR. At entrances and where wheeled vehicles or carts are used, cover tile with plywood, hardboard, or particle board over paper, secured and maintained until removal is directed by COR.

E. When protective materials are removed and immediately prior to acceptance, replace damaged tile and mouldings, re-clean resilient materials.

3.5 LOCATION:

A. Unless otherwise indicated in construction documents, install tile flooring, under areas where casework, laboratory and pharmacy furniture and other equipment occur.

B. Extend tile flooring for room into adjacent closets and alcoves.

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SECTION 09 67 23.20
RESINOUS (EPOXY BASE) WITH VINYL CHIP BROADCAST (RES-2)

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies Resinous (Resinous epoxy base with vinyl chip flake broadcast) flooring with integral cove base:

1. Res-2 Resinous (epoxy) vinyl chip flake broadcast flooring system.

1.2 RELATED WORK

A. Concrete and Moisture Vapor Barrier: Section 03 30 00, CAST-IN-PLACE CONCRETE.

B. Substrate Preparation for Floor Finishes: Section 09 05 16.

C. Color and location of each type of resinous flooring: As indicated in drawings.

D. Floor Drains: Division 22, PLUMBING.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data:

1. Description of each product to be provided.
2. Application and installation instructions.
3. Maintenance Instructions: Submit manufacturer’s written instructions for recommended maintenance practices.

C. Qualification Data: For Installer.

D. Sustainable Submittal:

1. Product data for products having recycled content, submit documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include statements indicating costs for each product having recycled content.
2. Product data for field applied, interior, paints, coatings, and primers, include printed statement of VOC content indicating compliance with environmental requirements.

E. Samples:

1. Each color and texture specified in drawings.

2. Samples for verification: For each (color and texture) resinous flooring system required, 6 inches (152 mm) square, applied to a rigid backing by installer for this project.
3. Sample showing construction from substrate to finish surface in thickness specified and color and texture of finished surfaces. Finished flooring must match the approved samples in color and texture.

F. Shop Drawings: Include plans, sections, component details, and attachment to other trades. Indicate layout of the following:
1. Patterns.
2. Edge configuration.

G. Certifications and Approvals:
1. Manufacturer's certification of material and substrate compliance with specification.
2. Manufacturer's approval of installer.
3. Contractor's certificate of compliance with Quality Assurance requirements.

H. Warranty: As specified in this section.

1.4 QUALITY ASSURANCE

A. Manufacture Certificate: Manufacture shall certify that a particular resinous flooring system has been manufactured and in use for a minimum of five (5) years.

B. Installer Qualifications: Engage an experienced installer (applicator) who is experienced in applying resinous flooring systems similar in material, design, and extent to those indicated for this project for a minimum period of five (5) years, whose work has resulted in applications with a record of successful in-service performance, and who is acceptable to resinous flooring manufacturer.
1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
2. Contractor shall have completed at least ten (10) projects of similar size and complexity. Include list of at least five (5) projects. List must include owner (purchaser); address of

installation, contact information at installation project site; and date of installation.

3. Installer's Personnel: Employ persons trained for application of specified product.

C. Source Limitations:

1. Obtain primary resinous flooring materials including primers, resins, hardening agents, grouting coats and finish or sealing coats from a single manufacturer.
2. Provide secondary materials, including patching and fill material, joint sealant, and repair material of type and from source recommended by manufacturer of primary materials.

D. Pre-Installation Conference:

1. Convene a meeting not less than thirty days prior to starting work.
2. Attendance:
   a. Contractor
   b. VA COR
   c. Manufacturer and Installer's Representative
3. Review the following:
   a. Environmental requirements
      1) Air and surface temperature
      2) Relative humidity
      3) Ventilation
      4) Dust and contaminates
   b. Protection of surfaces not scheduled to be coated
   c. Inspect and discus condition of substrate and other preparatory work performed
   d. Review and verify availability of material; installer’s personnel, equipment needed
   e. Design and edge conditions.
   f. Performance of the coating with chemicals anticipated in the area receiving the resinous (urethane and epoxy mortar/cement) flooring system
   g. Application and repair
   h. Field quality control
   i. Cleaning

j. Protection of coating systems

k. One-year inspection and maintenance

l. Coordination with other work

E. Manufacturer’s Field Services: Manufacturer’s representative shall provide technical assistance and guidance for surface preparation and application of resinous flooring systems.

F. Contractor Job Site Log: Contractor shall document daily; the work accomplished environmental conditions and any other condition event significant to the long term performance of the urethane and epoxy mortar/cement flooring materials installation. The Contractor shall maintain these records for one year after Substantial Completion.

1.5 MATERIAL PACKAGING DELIVERY AND STORAGE

A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.

B. Protect materials from damage and contamination in storage or delivery, including moisture, heat, cold, direct sunlight, etc.

C. Maintain temperature of storage area between 60 and 80 degrees F (15 and 26 degrees C).

D. Keep containers sealed until ready for use.

E. Do not use materials beyond manufacturer’s shelf life limits.

F. Package materials in factory pre-weighed and in single, easy to manage batches sized for ease of handling and mixing proportions from entire package or packages. No On site weighing or volumetric measurements are allowed.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

1. Maintain material and substrate temperature between 65 and 85 degrees F (18 and 30 degrees C) during resinous flooring application and for not less than 24 hours after application.

2. Concrete substrate shall be properly cured per referenced section 03 30 00, CAST-IN-PLACE CONCRETE. Standard cure time a minimum of 30

days. A vapor barrier must be present for concrete subfloors on or below grade.

a. Resinous flooring applications where moisture testing resulting in readings exceeding limits as defined in this specification under part 3, section 3.4, paragraph B, shall employ an multiple component 15 mil thick system designed to suppress excess moisture in concrete.
b. Application at a minimum thickness of 15 mils, over properly prepared concrete substrate as defined in section 3.4.
c. Moisture suppression system must meet the design standards as follows:

Property	Test	Value
Tensile Strength	ASTM D638	4,400 psi
Volatile Organic Compound Limits (V.O.C.)	EPA & LEED	25 grams per liter
Permeance	ASTM E96 @ 16mils/ 0.4mm on concrete	0.1 perms
Tensile Modulus	ASTM D638	$1.9X10^5$psi
Percent Elongation	ASTM D638	12%
Cure Rate	Per manufactures Data	4 hours Tack free with 24hr recoat window
Bond Strength	ASTM D7234	100% bond to concrete failure

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.7 WARRANTY

A. Work subject to the terms of the Article "Warranty of Construction" FAR clause 52.246-21.

B. Warranty: Manufacture shall furnish a single, written warranty covering the full assembly (including substrata) for both material and workmanship for a extended period of three (3) full years from date of installation, or provide a joint and several warranty signed on a single document by manufacturer and applicator jointly and severally warranting the materials and workmanship for a period of three (3) full years from date of installation. A sample warranty letter must be included with bid package or bid may be disqualified.

1.8 APPLICABLE PUBLICATIONS

A. The publication 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 Standard C722-18, "Standard Specification for Chemical-Resistant Monolithic Floor Surfacings," ASTM International, West Conshohocken, PA, www.astm.org.

1. Specification covers the requirements for aggregate-filled, resin-based, monolithic surfacings for use over concrete.

C. ASTM International(ASTM):

C413-18.....Absorption of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

C531-18.....Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes

D638-22.....Tensile Properties of Plastics

D790-17.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D1308-22.....Effect of Household Chemicals on Clear and Pigmented Organic Finishes

D2240-15e1.....Rubber Property—Durometer Hardness

D4060-19.....Abrasion Resistance of Organic Coatings by the Taber Abraser

D4226-19e1.....Impact Resistance of Rigid (Poly-Vinyl Chloride) (PVC) Building Products

D4259-24.....Abrading Concrete to alter the surface profile of the concrete and to remove foreign materials and weak surface laitance

E96/E96M-24.....Water Vapor Transmission of Materials

F1869-23.....Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride

F2170-19a.....Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

D. American National Standards Institute (ANSI)

A326.3-21.....Standard Test Method for Measuring Dynamic Coefficient of Friction of Hard Surface Flooring Materials

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION FOR RES-2 (BROADCAST VINYL CHIP FLAKE)

A. System Descriptions:

1. Monolithic, multi-component epoxy chemistry resinous flooring system. Primer with broadcast quartz aggregates, High performance multi-component solvent free epoxy undercoat, Vinyl chip flake broadcast media in desired flake size (1/8”, 1/4”). High performance multi component epoxy and solvent free sealers. System overall thickness 2-3mm.

B. Products: Subject to compliance with applicable fire, health, environmental, and safety requirements for storage, handling, installation, and clean up.

C. System Components: Verify specific requirements as systems vary by manufacturer. Verify build up layers of broadcast and installation method. Verify compatibility with substrate. Use manufacturer’s standard components, compatible with each other and as follows:

1. Primer with Broadcast quartz (primer coat):

a. Resin: epoxy.
b. Formulation Description: Multiple component high solids.
c. Application Method: squeegee, back roll and broadcast.
d. Thickness of coat(s): 10-20 mil.
e. Number of Coats: One.
f. Aggregates: Quartz broadcast into wet epoxy primer.

2. Undercoat: (body coat)
   a. Resin: Epoxy.
   b. Formulation Description: Pigmented multi-component, high solids.
   c. Application Method: Notched squeegee and Back roll
   d. Number of Coats: One.
   e. Aggregates: vinyl chip flake broadcast into wet Undercoat.
   f. Thickness of coat(s): 30-60 mils.
   g. Number of Coats: One.
3. Sealer coat:
   a. Resin: Epoxy.
   b. Formulation Description: Multiple component high solids, no solvent UV stable.
   c. Type/Finsh: Clear Gloss.
   d. Thickness of coat(s): 5-10 mils.
   e. Number of Coats: (2) two.
   f. Application: Squeegee and finish roll.

D. System Characteristics:
1. Color and Pattern: As selected by COR from manufacturer's standard colors.
2. Integral cove base: ½ inch radius epoxy mortar cove keyed into concrete substrate and or resinous flooring mortar system. No fillers integral cove base must be troweled in place with specified resinous mortar base.
3. Overall System Thickness: Nominal 1/8”, 2 to 3 mm.
4. Finish: anti-slip resistant.
5. Temperature Range: Systems vary by manufacturer; approximate range from a minimum of 45 to 150 degrees F.

E. Physical Properties:

1. In accordance with ANSI A326.3 the DCOF (Dynamic Coefficient of Friction) shall be 0.42 or greater when the flooring surface is wet
2. Physical Properties of flooring system when tested as follows

F. Chemical Resistance in accordance ASTM D1308 - 02(2007) "Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes". ASTM International, West Conshohocken, PA, 2006, DOI: 10.1520/D1308-02R07, www.astm.org. No effect to the following exposures:

Property	Test	Value
Tensile Strength	ASTM D638	5,200 psi
Volatile Organic Compound Limits (V.O.C.)	EPA & LEED	Below 100 g/l
Flexural Strength	ASTM D790	4,000 psi
Water Absorption	ASTM C413	0.056%
Impact Resistance	ASTM D4226	> 160 in. lbs
Abrasion Resistance	ASTM D4060 CS-17	0.03 gm maximum weight loss
Thermal Coefficient of Linear Expansion	ASTM C531	17 x 10-6 in/in °F
Hardness Shore D	ASTM D2240	85 to 90
Bond Strength	ASTM D7234	100% bond to concrete failure

1. Acetic acid (5 percent)
2. Ammonium hydroxide (10 percent)
3. Citric Acid (50 percent)
4. Fatty Acid
5. Motor Oil, 20W
6. Hydrochloric acid (20 percent)
7. Sodium Chloride
8. Sodium Hypochlorite (10 percent)
9. Sodium Hydroxide (30 percent)
10. Sulfuric acid (25 percent)
11. Urine, Feces

12. Hydrogen peroxide (10 percent)

2.2 SUPPLEMENTAL MATERIALS

A. Textured Top Coat: Type recommended or produced by manufacturer of seamless resinous flooring system, slip resistance for desired final finish.

B. Joint Sealant: Type recommended or produced by resinous flooring manufacturer for type of service or joint conditioned indicated.

C. Waterproof Membrane: Type recommended or produced by manufacturer of resinous floor coatings for type of service and conditions as specified.

D. Crack Isolation Membrane: Type recommended or produced by manufacturer of resinous flooring for conditions as indicated in Drawings and/or specified.

E. Patching and Fill Material: Resinous product of or approved by resinous coating manufacturer for application indicated. Resinous based materials only. Cementitious or single component product are not expectable.

2.3 BASE CAP STRIP

A. Zinc cove strip.

B. Shape for 2mm depth of base material, "J" or “L” configuration.

C. Finish:

1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the areas and conditions where monolithic resinous system with integral base is to be installed with the VA COR.

B. Moisture Vapor Emission Testing: Perform moisture vapor transmission testing in accordance with ASTM F1869 to determine the MVER of the substrate prior to commencement of the work. See section 3.4, 3.

3.2 PROJECT CONDITIONS

A. Maintain temperature of rooms (air and surface) where work occurs, between 70- and 90-degrees F (21 and 32 degrees C) for at least 48 hours, before, during, and 24 hours after installation. Maintain temperature at least 70 degrees F (21 degrees C) during cure period.

B. Maintain relative humidity less than 75 percent.

C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

D. Maintain proper ventilation of the area during application and curing time period.

1. Comply with infection control measures of the VA Medical Center.

3.3 INSTALLATION REQUIREMENTS

A. The manufacturer's instructions for application and installation shall be reviewed with the VA COR for the seamless resinous (urethane and epoxy mortar) flooring system with integral cove base.

B. Substrate shall be approved by manufacture technical representative.

3.4 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Prepare concrete substrates as follows:

a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and re circulates the shot by vacuum pickup.

b. Comply with ASTM D4259 requirements, unless manufacturer's written instructions are more stringent.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written recommendations.

3. Verify that concrete substrates are dry.

a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application only after substrates have maximum moisture-vapor-emission rate of [**3 lb of water/1000 square feet (1.36 kg of water/92.9 square meters)** in 24 hours. Per manufacturers recommendations.
b. MVT threshold for monolithic resinous flooring shall not exceed 3 lbs/1000 square feet (0.0001437 kPa) in a 24-hour period.
c. When MVT emission exceeds this limit, apply manufacturer's recommended vapor control primer or other corrective measures as recommended by manufacturer prior to application of flooring or membrane systems.
d. Perform in situ probe test, ASTM F2170. Proceed with application only after substrates do not exceed a maximum potential equilibrium relative humidity of 85 percent.
e. Provide a written report showing test placement and results.

4. Verify that concrete substrates have neutral Ph and that resinous flooring will adhere to them. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.
D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
E. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations. Allowances should be included for flooring manufacturer recommended joint fill material, and concrete crack treatment.
F. Prepare wall to receive integral cove base:
1. Verify wall material is acceptable for resinous flooring application, if not, install material (e.g. cement board) to receive base.
2. Fill voids in wall surface to receive base, install undercoats (e.g. water proofing membrane, and/or crack isolation membrane) as recommended by resinous flooring manufacturer.

3. Install base prior to flooring if required by resinous flooring manufacturer.
4. Grind, cut or sand protrusions to receive base application.

3.5 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
   1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
   2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

   3. At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.
      a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate for all areas to receive integrated cove base.
C. Apply cove base: Trowel to wall surfaces at a 1-inch radius, before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, and troweling, sanding, and top coating of cove base. Round internal and external corners.
D. Apply Primer: over prepared substrate at manufacturer's recommended spreading rate.

E. Trowel mortar base: Mix mortar material according to manufacturer's recommended procedures. Climatic and non-climatic resinous flooring systems may vary slightly on mode of application. Application should be based upon the following: Uniformly spread mortar over substrate using a specially designed screed box adjusted to manufacturer's recommended

height. Metal trowel (hand or power) single mortar coat in thickness indicated for flooring system, grout to fill substrate voids. When cured, sand to remove trowel marks and roughness.

F. Broadcast: Immediately broadcast quartz silica aggregate into the primer using manufacturer's spray caster. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

G. Under Coat: Mix base material according to manufacturer's recommended procedures. Uniformly spread mixed material over previously primed substrate using manufacturer's installation tool. Roll material with strict adherence to manufacturer's installation procedures and coverage rates.

H. Broadcast: Immediately broadcast vinyl flakes into the body coat. Strict adherence to manufacturer's installation procedures and coverage rates is imperative.

I. First Sealer: Remove excess un-bonded flakes by lightly brushing and vacuuming the floor surface. Mix and apply sealer with strict adherence to manufacturer's installation procedures.

J. Second Sealer: Lightly sand first sealer coat. Mix and apply second sealer coat with strict adherence to manufacturer's installation procedures.

3.6 TOLERANCE

A. From line of plane: Maximum 1/8 inch (3.18 mm) in total distance of flooring and base. Broadcast resinous flooring system will contour substrate. Deviation and tolerance are subject to concrete tolerance.

B. From radius of cove: Maximum of 1/8 inch (3.18 mm) plus or 1/16-inch (1.59 mm) minus.

3.7 ENGINEERING DETAILS

A. Chase edges to “lock” the flooring system into the concrete substrate along lines of termination.

B. Penetration Treatment: Lap and seal resinous system onto the perimeter of the penetrating item by bridging over compatible elastomer at the interface to compensate for possible movement.

C. Trenches: Continue flooring system into trenches to maintain monolithic protection. Treat cold joints to assure bridging of potential cracks.

D. Treat floor drains by chasing the flooring system to lock in place at point of termination.

E. Treat control joints to bridge potential cracks and to maintain monolithic protection. Treat cold joints and construction joints to bridge potential cracks and to maintain monolithic protection on horizontal and vertical surfaces as well as horizontal and vertical interfaces.

F. Discontinue Resinous floor system at vertical and horizontal contraction and expansion joints by installing backer rod and compatible sealant after coating installation is completed. Provide sealant type recommended by manufacturer for traffic conditions and chemical exposures to be encountered.

3.8 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process.

B. Close area of application for a minimum of 24 hours.

C. Protect resinous flooring materials from damage and wear during construction operation.

1. Cover flooring with kraft type paper.
2. Optional 6 mm (1/4 inch) thick hardboard, plywood, or particle board where area is in foot or vehicle traffic pattern, rolling or fixed scaffolding and overhead work occurs.

D. Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

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SECTION 09 68 00
CARPETING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section specifies carpet, molding, adhesives, and other items required for complete installation.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES: Testing of Concrete Floors Before Installation.

C. Section 09 65 13, RESILIENT BASE AND ACCESSORIES: Resilient Wall Base.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A company specializing in carpet installation with a minimum three (3) years' experience and employing experienced flooring installers who have retained, and currently hold, an INSTALL Certification, or a certification from a comparable certification program, and a valid OSHA 10 certification.

1. Installers to be certified by INSTALL or a comparable certification program with the following minimum criteria:
   a. US Department of Labor approved four (4) year apprenticeship program, 160 hours a year.
   b. Career long training.
   c. Manufacturer endorsed training.
   d. Fundamental journeyman skills certification.

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. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Product Data:

1. Manufacturer's catalog data and printed documentation stating physical characteristics, durability, resistance to fading and flame

resistance characteristics for each type of carpet material and installation accessory.

2. Manufacturer's printed installation instructions for the carpet, including preparation of installation substrate, seaming techniques and recommended adhesives and tapes.

D. Samples:

1. Carpet: "Production Quality" samples 305 x 305 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in drawings.
2. Floor Edge Strip (Molding): 152 mm (6 inches) long of each color and type specified.
3. Base Edge Strip (Molding): 152 mm (6 inches) long of each color specified.

E. Shop Drawings: Installers layout plan showing seams and cuts for sheet carpet and carpet module.

F. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

G. Installer's Qualifications.

H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

A. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's brand name, size, dye lot number and related information. Transport carpet to job site in a manner that prevents damage and distortion that might render it unusable. When bending or folding is unavoidable for delivery purposes, unfold carpet and lay flat immediately.

B. Deliver adhesives in containers clearly labeled with manufacturer's brand name, number, installation instructions, safety instructions and flash points.

C. Store in a clean, dry, well-ventilated area, protected from damage and soiling. Before installation, acclimate carpet to the atmospheric conditions of the areas in which it will be installed for 2 days prior to installation

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain areas in which carpeting is to be installed at a temperature between 18 - 35 degrees C (65 - 95 degrees F) with a maximum relative humidity of 65 percent for two (2) days before installation, during installation and for three (3) days after installation.

B. Minimum Substrate Surface Temperature: 18 degrees C (65 degrees F) at time of installation.

C. Three (3) days after installation, maintain minimum temperature of 10 degrees C (50 degrees F) for the duration of the contract.

1.7 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their carpet for a minimum of ten (10) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

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 National Standards Institute (ANSI):

ANSI/NSF 140-19.....Sustainable Carpet Assessment Standard

C. American Association of Textile Chemists and Colorists (AATCC):

16-23.....Colorfastness to Light

134-19.....Electric Static Propensity of Carpets

165-21.....Colorfastness to Crocking: Textile Floor Coverings-AATCC Crockmeter Method

174-22e.....Antimicrobial Activity Assessment of New Carpets

D. ASTM International (ASTM):

D1335-21.....Tuft Bind of Pile Yarn Floor Coverings

D3278-21.....Flash Point of Liquids by Small Scale Closed-Cup Apparatus

D5116-17.....Determinations of Organic Emissions from Indoor Materials/Products

D5252-20.....Operation of the Hexapod Tumble Drum Tester

D5417-21.....Operation of the Vettermann Drum Tester

E648-19ae1.....Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source

E. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

F. The Carpet and Rug Institute (CRI):

CIS.....Carpet Installation Standard

G. International Standards and Training Alliance (INSTALL)

H. International Organization for Standardization (ISO):

2551-20.....Machine-Made Textile Floor Coverings

I. U.S. Consumer Product and Safety Commission (CPSC):

16 CFR 1630.....Surface Flammability of Carpets and Rugs

PART 2 - PRODUCTS

2.1 CARPET

A. Physical Characteristics:

1. Carpet free of visual blemishes, streaks, poorly dyed areas, fuzzing of pile yarn, spots or stains and other physical and manufacturing defects.
2. Type:
   a. Carpet Construction: Tufted.
   b. Carpet Type: Modular tile 18 by 36 with 0.15 percent growth/shrink rate in accordance with ISO 2551.
   c. Pile Type: Textured Loop. Pile type and thickness must conform to ADA requirements.
   d. Pile Fiber: Commercial 100 percent branded (federally registered trademark), nylon continuous filament.
3. Static Control: Provide static control to permanently regulate static buildup to less than 3.5 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.

4. Backing Materials: Provide backing for glue-down installations. For healthcare installations, provide impervious moisture backing that is 100 percent PVC free.
   a. Modular Tile:
      1) Primary Backing/Backcoating: Manufacturer's standard composite materials .
      2) Secondary Backing: Manufacturer's standard material .
5. Appearance Retention Rating (ARR): Carpet to be tested and have the minimum 3.5 – 4.0 severe ARR when tested in accordance with either the ASTM D5252 (Hexapod) or ASTM D5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified in the ASTM standard.
6. Tuft Bind: Comply with ASTM D1335 for tuft bind force required to pull a tuft or loop free from carpet backing with a minimum 36 N (8 pound) average force for modular carpet tile.
7. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, minimum class 4 rating.
8. Colorfastness to Light (AATCC 16, Option 3): Color change between the exposed and unexposed carpet areas equivalent to a minimum of Grade 4 on the Gray Scale for Color Change after an exposure of 40 AFU (AATCC fading units) for all specified colors.
9. Delamination Strength: Minimum of 440 N/m (2.5 lb./inch) between secondary backing.
10. Flammability and Critical Radiant Flux Requirements:
    a. Comply with 16 CFR 1630.
    b. Test Carpet in accordance with ASTM E648.
    c. Class I: Minimum critical radiant flux of 0.45 watts per square centimeter (2.9 watts per square inch).
    d. Carpet in corridors, exits and Medical Facilities to be Class I.
11. Average Pile Yarn Density (APYD):
    a. Corridors, lobbies, entrances, common areas or multipurpose rooms, open offices, waiting areas and dining areas: Minimum APYD 6000.
    b. Other areas: Minimum APYD 4000.

12. Antimicrobial: Nontoxic antimicrobial treatment in accordance with AATCC 174 Part I (qualitative), guaranteed by the carpet manufacturer to last the life of the carpet.
13. VOC Limits: Use carpet that complies with the following limits for VOC content when tested according to ASTM D5116:
    a. Carpet, Total VOCs: 0.5 mg/square meter x hour
    b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/square meter x hour
    c. Carpet, Formaldehyde: 0.05 mg/square meter x hour.
    d. Carpet, Styrene: 0.4 mg/square meter x hour

2.2 ADHESIVE AND CONCRETE PRIMER

A. Provide water resistant, mildew resistant, nonflammable, and nonstaining adhesives and concrete primers for carpet installation. Provide release adhesive for modular tile carpet as recommended by the carpet manufacturer. Provide adhesives flashpoint of minimum 60 degrees C (140 degrees F) in accordance with ASTM D3278. Materials are to have a VOC maximum of 50 g/L when calculated according to 40 CFR 59, (EPA Method 24).

2.3 SEAMING TAPE

A. Provide tape for seams as recommended by the carpet manufacturer for the type of seam used in installation. Seam sealant is to have a maximum VOC content of 50 g/L when calculated according to 40 CFR 59, (EPA Method 24). Do not use sealants that contain 1,1,1-trichloroethane or toluene.

2.4 EDGE STRIPS (MOLDING)

A. Metal:
    1. Utilize metal in corridors and where subject to crat traffic.
    2. Hammered surface aluminum, pinless, clamp down type designed for the carpet being installed.
    3. Floor flange not less than 38 mm (1-1/2 inches) wide, face not less than 16 mm (5/8 inch) wide.
    4. Finish: Clear anodic coating unless specified otherwise in drawings.

B. Vinyl Edge Strip:
    1. For use in low traffic areas. Beveled floor flange minimum 50 mm (2 inches) wide.

2. Beveled surface to finish flush with carpet for tight joint and other side to floor finish.
3. Color as specified in drawings.

C. Carpet Base Top Edge Strip:
1. Vinyl "J" strip wall flange minimum of 38 mm (1-1/2 inches) wide with cap beveled from wall to finish flush with carpet being installed.
2. Color as specified in drawings.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Contractor to prepare and test surfaces to receive carpet and adhesives as per Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

3.2 GENERAL INSTALLATION

A. Isolate area of installation from rest of building.
B. Perform all work by manufacturer’s approved installers. Conduct installation in accordance with the manufacturer’s printed instructions and CRI CIS.
C. Protect edges of carpet meeting hard surface flooring with molding and install in accordance with the molding manufacturer’s printed instructions.
D. Follow ventilation, personal protection, and other safety precautions recommended by the adhesive manufacturer. Continue ventilation during installation and for at least three (3) days following installation.
E. Do not permit traffic or movement of furniture or equipment in carpeted area for 24 hours after installation.
F. Complete other work which would damage the carpet prior to installation of carpet.
G. Follow carpet manufacturer's recommendations for matching pattern and texture directions.
H. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations. Bind or seal cut edge of sheet carpet. Use additional adhesive to secure carpets around pipes and other vertical projections.

3.3 BROADLOOM CARPET INSTALLATION

3.4 MODULAR TILE INSTALLATION

A. Install per CRI CIS, Adhesive Application.

B. Lay carpet modules with pile in same direction unless specified otherwise in drawings.

C. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.

D. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.

3.5 EDGE STRIPS INSTALLATION

A. Install edge strips over exposed carpet edges adjacent to uncarpeted finish flooring.

B. Anchor metal strips to floor with suitable fasteners. Apply adhesive to edge strips, insert carpet into lip and press it down over carpet.

C. Anchor vinyl edge strip to floor with adhesive. Apply adhesive to edge strip and insert carpet into lip and press lip down over carpet.

D. Carpet Base Top Edge Strip Installation:

1. Place carpet molding at top edge of carpet where turned up as base.
2. Install molding in accordance with manufacturer's instructions.

3.6 PROTECTION AND CLEANING

A. Once a carpet installation is complete, clean up scrap materials and debris, and vacuum the area, using manufacturer-approved equipment. Inspect seams carefully for evenness and protruding backing yarns, and inspect the perimeter of the installation for an acceptable finished appearance.

B. Protect installed carpet if furniture is being moved, by laying plywood, fiberboard or porous non-staining sheeting material for minimum time practical. Based on manufacturer guidelines, protect carpet from rolling or foot traffic. Protect against other materials or renovation or construction activities, including dust, debris, paint, contractor traffic, until it is ready for its final use.

C. Do not move furniture or equipment on unprotected carpeted surfaces.

D. Just before final acceptance of work, remove protection and vacuum carpet clean.

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SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 **DESCRIPTION**

A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the construction documents and/or specified herein, including, but not limited to, the following:

1. Prime coats which may be applied in shop under other sections.
2. Prime painting unprimed surfaces to be painted under this Section.
3. Painting items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
4. Painting ferrous metal (except stainless steel) exposed to view.
5. Painting galvanized ferrous metals exposed to view.
6. Painting interior concrete block exposed to view.
7. Painting gypsum drywall exposed to view.
8. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
9. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers lighting fixtures, and the like, which are exposed to view through these items.
10. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.
11. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
12. Painting of any surface not specifically mentioned to be painted herein or on construction documents, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, is to be included as though specified.

1.2 **RELATED WORK**

A. Section 01 35 26, SAFETY REQUIREMENTS: Activity Hazard Analysis.

B. Section 01 81 13, SUSTAINABLE CONSTUCTION REQUIREMENTS: Sustainable Design Requirements.

C. Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL: Lead Paint Removal.

D. Section 04 05 13, MASONRY MORTARING: Masonry Repairs.

E. Section 04 05 16, MASONRY GROUTING: Masonry Repairs.

F. Division 05 METALS: Shop prime painting of steel and ferrous metals.

G. Division 08 OPENINGS: Shop prime painting of steel and ferrous metals.

H. Section 08 14 00, INTERIOR WOOD DOORS: Prefinished flush doors with transparent finishes.

I. Finish legend schedule in drawings: Type of Finish, Color, and Gloss Level of Finish Coat.

J. Division 10 SPECIALTIES: Shop prime painting of steel and ferrous metals.

K. Division 11 EQUIPMENT: Shop prime painting of steel and ferrous metals.

L. Division 12 FURNISHINGS: Shop prime painting of steel and ferrous metals.

M. Division 13 SPECIAL CONSTRUCTION: Shop prime painting of steel and ferrous metals.

N. Division 14 CONVEYING EQUIPMENT: Shop prime painting of steel and ferrous metals.

O. Division 21 FIRE SUPPRESSION: Shop prime painting of steel and ferrous metals.

P. Division 22 PLUMBING: Shop prime painting of steel and ferrous metals.

Q. Division 23 HEATING; VENTILATION AND AIR-CONDITIONING: Shop prime painting of steel and ferrous metals.

R. Division 26 ELECTRICAL: Shop prime painting of steel and ferrous metals.

S. Division 27 COMMUNICATIONS: Shop prime painting of steel and ferrous metals.

T. Division 28 ELECTRONIC SAFETY AND SECURITY: Shop prime painting of steel and ferrous metals.

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. Painter qualifications.

D. Manufacturer's Literature and Data:

1. Before work is started, or sample panels are prepared, submit manufacturer's literature and technical data, the current Master Painters Institute (MPI) "Approved Product List" indicating brand label, product name and product code as of the date of contract award, will be used to determine compliance with the submittal requirements of this specification. The Contractor may choose to use subsequent MPI "Approved Product List", however, only one (1) list may be used for the entire contract and each coating system is to be from a single manufacturer. All coats on a particular substrate must be from a single manufacturer. No variation from the MPI "Approved Product List" where applicable is acceptable.

E. Sample of identity markers if used.

F. Manufacturers' Certificates indicating compliance with specified requirements:

1. Manufacturer's paint substituted for Federal Specification paints meets or exceeds performance of paint specified.
2. High temperature aluminum paint.
3. Epoxy coating.
4. Intumescent clear coating or fire-retardant paint.
5. Plastic floor coating.

1.4 **DELIVERY AND STORAGE**

A. Deliver materials to site in manufacturer's sealed container marked to show following:

1. Name of manufacturer.
2. Product type.
3. Batch number.
4. Instructions for use.
5. Safety precautions.

B. In addition to manufacturer's label, provide a label legibly printed as following:

1. Federal Specification Number, where applicable, and name of material.
2. Surface upon which material is to be applied.
3. Specify Coat Types: Prime; body; finish; etc.

C. Maintain space for storage, and handling of painting materials and equipment in a ventilated, neat and orderly condition to prevent spontaneous combustion from occurring or igniting adjacent items.

D. Store materials at site at least 24 hours before using, at a temperature between 7 and 30 degrees C (45 and 85 degrees F).

1.5 **QUALITY ASSURANCE**

A. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces. Submit evidence that key personnel have successfully performed surface preparation and application of coating on a minimum of three (3) similar projects within the past three (3) years.

B. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Contracting Officer Representative (COR) in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

1.6 **MOCK-UP PANEL**

1.7 **REGULATORY REQUIREMENTS**

A. Paint materials are to conform to the restrictions of the local Environmental and Toxic Control jurisdiction.

1. Volatile Organic Compounds (VOC) Emissions Requirements: Field-applied paints and coatings that are inside the waterproofing system to not exceed limits of authorities having jurisdiction.
2. Lead-Base Paint:
   a. Comply with Section 410 of the Lead-Based Paint Poisoning Prevention Act, as amended, and with implementing regulations promulgated by Secretary of Housing and Urban Development.
   b. Regulations concerning prohibition against use of lead-based paint in federal and federally assisted construction, or rehabilitation of

residential structures are set forth in Subpart F, Title 24, Code of Federal Regulations, Department of Housing and Urban Development.

c. Do not use coatings having a lead content over 0.06 percent by weight of non-volatile content.

d. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.

3. Asbestos: Provide materials that do not contain asbestos.

4. Chromate, Cadmium, Mercury, and Silica: Provide materials that do not contain zinc-chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.

5. Human Carcinogens: Provide materials that do not contain any of the ACGIH-BKLT and ACGHI-DOC confirmed or suspected human carcinogens.

6. Use high performance acrylic paints in place of alkyd paints.

1.8 **SAFETY AND HEALTH**

A. Apply paint materials using safety methods and equipment in accordance with the following:

1. Comply with applicable Federal, State, and local laws and regulations, and with the ACCIDENT PREVENTION PLAN, including the Activity Hazard Analysis (AHA) as specified in Section 01 35 26, SAFETY REQUIREMENTS. The AHA is to include analyses of the potential impact of painting operations on painting personnel and on others involved in and adjacent to the work zone.

B. Safety Methods Used During Paint Application: Comply with the requirements of SSPC PA Guide 10.

C. Toxic Materials: To protect personnel from overexposure to toxic materials, conform to the most stringent guidance of:

1. The applicable manufacturer’s Material Safety Data Sheets (MSDS) or local regulation.

2. 29 CFR 1910.1000.

3. ACHIH-BKLT and ACGHI-DOC, threshold limit values.

1.9 **APPLICABLE PUBLICATIONS**

A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by basic designation only.

B. American Conference of Governmental Industrial Hygienists (ACGIH):

ACGIH TLV-BKLT-2024.....Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)

ACGIH TLV-DOC-2024......Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)

C. ASME International (ASME):

A13.1-23.....Scheme for the Identification of Piping Systems

D. Code of Federal Regulation (CFR):

40 CFR 59.....Determination of Volatile Matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating

E. Commercial Item Description (CID):

A-A-1272A.....Plaster Gypsum (Spackling Compound)

F. Federal Specifications (Fed Spec):

TT-P-1411A.....Paint, Copolymer-Resin, Cementitious (For Waterproofing Concrete and Masonry Walls) (CEP)

G. Master Painters Institute (MPI):

1.....Aluminum Paint

3.....Primer, Alkali Resistant, Water Based

4.....Interior/ Exterior Latex Block Filler

5.....Exterior Alkyd Wood Primer

6.....Exterior, Latex for Exterior Wood Primer

7.....Exterior Oil Wood Primer

8.....Exterior Alkyd, Flat MPI Gloss Level 1

9.....Exterior Alkyd Enamel MPI Gloss Level 6

10.....Exterior Latex, Flat

11.....Exterior Latex, Semi-Gloss

15.....Exterior Latex, Low Sheen (MPI Gloss Level 3-4)

17.....Primer, Bonding, Waterbased

18.....Organic Zinc Rich Primer

22.....Aluminum Paint, High Heat (up to 590% - 1100F)

23.....Primer, Metal, Surface Tolerant

27.....Exterior / Interior Alkyd Floor Enamel, Gloss

31.....Polyurethane, Moisture Cured, Clear Gloss

36.....Knot Sealer

39.....Primer, Latex, for Interior Wood
40.....Exterior, Latex High Build
42.....Textured Coating, Latex, Flat
43.....Interior Satin Latex, MPI Gloss Level 4
44.....Interior Low Sheen Latex, MPI Gloss Level 2
45.....Interior Primer Sealer
46.....Interior Enamel Undercoat
47.....Interior Alkyd, Semi-Gloss, MPI Gloss Level 5
48.....Interior Alkyd, Gloss, MPI Gloss Level 6
50.....Interior Latex Primer Sealer
51.....Interior Alkyd, Eggshell, MPI Gloss Level 3
52.....Interior Latex, MPI Gloss Level 3
53.....Interior Latex, Flat, MPI Gloss Level 1
54.....Interior Latex, Semi-Gloss, MPI Gloss Level 5
59.....Interior/Exterior Alkyd Porch & Floor Enamel, Low Gloss
60.....Interior/Exterior Latex Porch & Floor Paint, Low Gloss
66.....Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved)
67.....Interior Latex Fire Retardant, Top-Coat (ULC Approved)
68.....Interior/ Exterior Latex Porch & Floor Paint, Gloss
71.....Polyurethane, Moisture Cured, Clear, Flat
77.....Epoxy Cold Cured, Gloss
79.....Marine Alkyd Metal Primer
90.....Interior Wood Stain, Semi-Transparent
91.....Wood Filler Paste
94.....Exterior Alkyd, Semi-Gloss
95.....Fast Drying Metal Primer
98.....High Build Epoxy Coating
99.....Sealer, Water-based, for Concrete Floors
101.....Epoxy Anti-Corrosive Metal Primer
107.....Primer, Rust-Inhibitive, Water-based

108.....High Build Epoxy Coating, Low Gloss
113.....Elastomeric, Pigmented, Exterior, Water-based, Flat
114.....Interior Latex, Gloss
115.....Epoxy-Modified Latex, Interior Gloss (MPI gloss level 6)
118.....Dry Fall, Latex Flat
119.....Exterior Latex, High Gloss (acrylic)
134.....Galvanized Water Based Primer
135.....Non-Cementitious Galvanized Primer
138.....Interior High Performance Latex, MPI Gloss Level 2
139.....Interior High Performance Latex, MPI Gloss Level 3
140.....Interior High Performance Latex, MPI Gloss Level 4
141.....Interior High Performance Latex (SG) MPI Gloss Level 5
144.....Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 2)
145.....Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 3)
146.....Latex, Interior, Institutional Low Odor / VOC, (MPI Gloss Level 4)
151.....Light Industrial Coating, Interior, Water-based, (MPI Gloss Level 3)
153.....Light Industrial Coating, Interior, Water-based, (MPI Gloss Level 4)
163.....Exterior Water Based Semi-Gloss Light Industrial Coating, MPI Gloss Level 5
164.....Exterior, Water Based, Gloss, Light Industrial Coating, MPI Gloss Level 6

H. Society for Protective Coatings (SSPC):

SSPC SP 1-82(2015/2016).Solvent Cleaning
SSPC SP 2-2018.....Hand Tool Cleaning
SSPC SP 3-2018.....Power Tool Cleaning
SSPC SP 10/NACE No.2....Near-White Blast Cleaning
SSPC PA Guide 10.....Guide to Safety and Health Requirements

I. Maple Flooring Manufacturer’s Association (MFMA):

J. U.S. National Archives and Records Administration (NARA):
29 CFR 1910.1000.....Air Contaminants

K. Underwriter's Laboratory (UL)

PART 2 - PRODUCTS

2.1 **MATERIALS:**

A. Conform to the coating specifications and standards referenced in PART 3. Submit manufacturer's technical data sheets for specified coatings and solvents.

2.2 **PAINT PROPERTIES:**

A. Use ready-mixed (including colors), except two component epoxies, polyurethanes, polyesters, paints having metallic powders packaged separately and paints requiring specified additives.

B. Where no requirements are given in the referenced specifications for primers, use primers with pigment and vehicle, compatible with substrate and finish coats specified.

C. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only to recommended limits.

D. VOC Content: For field applications that are inside the weatherproofing system, paints and coating to comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 gram/liter.
2. Non-flat Paints and Coatings: 150 gram/liter.
3. Dry-Fog Coatings: 400 gram/liter.
4. Primers, Sealers, and Undercoaters: 200 gram/liter.
5. Anticorrosive and Antirust Paints applied to Ferrous Metals: 250 gram/liter.
6. Zinc-Rich Industrial Maintenance Primers: 340 gram/liter.
7. Pretreatment Wash Primers: 420 gram/liter.
8. Shellacs, Clear: 730 gram/liter.
9. Shellacs, Pigmented: 550 gram/liter.

E. VOC test method for paints and coatings is to be in accordance with 40 CFR 59 (EPA Method 24). Part 60, Appendix A with the exempt compounds' content determined by Method 303 (Determination of Exempt Compounds) in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" manual.

2.3 **PLASTIC TAPE:**

A. Pigmented vinyl plastic film in colors as specified in Finish legend schedule in drawings or specified.

B. Pressure sensitive adhesive back.

C. Snap on coil plastic markers.

D. Widths as shown on construction documents.

2.4 **BIOBASED CONTENT**

A. Paint products shall comply with following bio-based standards for biobased materials:

Material Type	Percent by Weight
Interior Paint	20 percent biobased material
Interior Paint- Oil Based and Solvent Alkyd	67 percent biobased material
Exterior Paint	20 percent biobased material
Wood & Concrete Stain	39 percent biobased content
Polyurethane Coatings	25 percent biobased content
Water Tank Coatings	59 percent biobased content
Wood & Concrete Sealer- Membrane Concrete Sealers	11 percent biobased content
Wood & Concrete Sealer- Penetrating Liquid	79 percent biobased content

B. The minimum-content standards are based on the weight (not the volume) of the material.

PART 3 - EXECUTION

3.1 **JOB CONDITIONS:**

A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.

1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.

2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each day’s work.

B. Atmospheric and Surface Conditions:

1. Do not apply coating when air or substrate conditions are:

a. Less than 3 degrees C (5 degrees F) above dew point.
b. Below 10 degrees C (50 degrees F) or over 35 degrees C (95 degrees F), unless specifically pre-approved by the COR and the product manufacturer. Under no circumstances are application conditions to exceed manufacturer recommendations.
c. When the relative humidity exceeds 85 percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.

2. Maintain interior temperatures until paint dries hard.
3. Do no exterior painting when it is windy and dusty.
4. Do not paint in direct sunlight or on surfaces that the sun will warm.
5. Apply only on clean, dry and frost-free surfaces except as follows:
   a. Apply water thinned acrylic and cementitious paints to damp (not wet) surfaces only when allowed by manufacturer's printed instructions.
   b. Concrete and masonry when permitted by manufacturer's recommendations, dampen surfaces to which water thinned acrylic and cementitious paints are applied with a fine mist of water on hot dry days to prevent excessive suction and to cool surface.
6. Varnishing:
   a. Apply in clean areas and in still air.
   b. Before varnishing vacuum and dust area.
   c. Immediately before varnishing wipe down surfaces with a tack rag.

3.2 **INSPECTION:**

A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.3 **GENERAL WORKMANSHIP REQUIREMENTS:**

A. Application may be by brush or roller. Spray application only upon acceptance from the COR in writing.
B. Furnish to the COR a painting schedule indicating when the respective coats of paint for the various areas and surfaces will be completed. This schedule is to be kept current as the job progresses.
C. Protect work at all times. Protect all adjacent work and materials by suitable covering or other method during progress of work. Upon completion

of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and leave work in a clean condition.

D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.

E. When indicated to be painted, remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.

F. Materials are to be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.

G. Apply materials with a coverage to hide substrate completely. When color, stain, dirt or undercoats show through final coat of paint, the surface is to be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Government.

H. All coats are to be dry to manufacturer’s recommendations before applying succeeding coats.

I. All suction spots or “hot spots” in plaster after the application of the first coat are to be touched up before applying the second coat.

J. Do not apply paint behind frameless mirrors that use mastic for adhering to wall surface.

3.4 **SURFACE PREPARATION:**

A. General:

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished are to be completely dry, clean and smooth.

2. See other sections of specifications for specified surface conditions and prime coat.
3. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
4. Clean surfaces before applying paint or surface treatments with materials and methods compatible with substrate and specified finish. Remove any residue remaining from cleaning agents used. Do not use solvents, acid, or steam on concrete and masonry. Schedule the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.
5. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Concrete: 12 percent.
   b. Fiber-Cement Board: 12 percent.
   c. Masonry (Clay and CMU's): 12 percent.
   d. Wood: 15 percent.
   e. Gypsum Board: 12 percent.
   f. Plaster: 12 percent.

B. Ferrous Metals:
1. Remove oil, grease, soil, drawing and cutting compounds, flux and other detrimental foreign matter in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Remove loose mill scale, rust, and paint, by hand or power tool cleaning, as defined in SSPC-SP 2 (Hand Tool Cleaning) and SSPC-SP 3 (Power Tool Cleaning).
3. Fill dents, holes and similar voids and depressions in flat exposed surfaces of hollow steel doors and frames, access panels, roll-up steel doors and similar items specified to have semi-gloss or gloss finish with TT-F-322D (Filler, Two-Component Type, For Dents, Small Holes and Blow-Holes). Finish flush with adjacent surfaces.
   a. Fill flat head countersunk screws used for permanent anchors.
   b. Do not fill screws of item intended for removal such as glazing beads.

4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

C. Zinc-Coated (Galvanized) Metal Surfaces Specified Painted:
1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.

D. Masonry, Concrete, Cement Board:
1. Clean and remove dust, dirt, oil, grease efflorescence, form release agents, laitance, and other deterrents to paint adhesion.
2. Use emulsion type cleaning agents to remove oil, grease, paint and similar products. Use of solvents, acid, or steam is not permitted.
3. Remove loose mortar in masonry work.
4. Replace mortar and fill open joints, holes, cracks and depressions with new mortar specified in Section 04 05 13, MASONRY MORTARING Section 04 05 16, MASONRY GROUTING. Do not fill weep holes. Finish to match adjacent surfaces.
5. Neutralize Concrete floors to be painted by washing with a solution of 1.4 Kg (3 pounds) of zinc sulfate crystals to 3.8 L (1 gallon) of water, allow to dry three (3) days and brush thoroughly free of crystals.
6. Repair broken and spalled concrete edges with concrete patching compound to match adjacent surfaces as specified in Division 03, CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

E. Gypsum Plaster and Gypsum Board:
1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.

3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.5 **PAINT PREPARATION:**

A. Thoroughly mix painting materials to ensure uniformity of color, complete dispersion of pigment and uniform composition.

B. Do not thin unless necessary for application and when finish paint is used for body and prime coats. Use materials and quantities for thinning as specified in manufacturer's printed instructions.

C. Remove paint skins, then strain paint through commercial paint strainer to remove lumps and other particles.

D. Mix two (2) component and two (2) part paint and those requiring additives in such a manner as to uniformly blend as specified in manufacturer's printed instructions unless specified otherwise.

E. For tinting required to produce exact shades specified, use color pigment recommended by the paint manufacturer.

3.6 **APPLICATION:**

A. Start of surface preparation or painting will be construed as acceptance of the surface as satisfactory for the application of materials.

B. Unless otherwise specified, apply paint in three (3) coats; prime, body, and finish. When two (2) coats applied to prime coat are the same, first coat applied over primer is body coat and second coat is finish coat.

C. Apply each coat evenly and cover substrate completely.

D. Allow not less than 48 hours between application of succeeding coats, except as allowed by manufacturer's printed instructions, and approved by COR.

E. Apply by brush or roller. Spray application for new or existing occupied spaces only upon approval by acceptance from COR in writing.

1. Apply painting materials specifically required by manufacturer to be applied by spraying.
2. In new construction and in existing occupied spaces, where paint is applied by spray, mask or enclose with polyethylene, or similar air tight material with edges and seams continuously sealed including items specified in “Building and Structural Work Field Painting”; “Work not

Painted"; motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.

F. Do not paint in closed position operable items such as access doors and panels, window sashes, overhead doors, and similar items except overhead roll-up doors and shutters.

3.7 **PRIME PAINTING:**

A. After surface preparation, prime surfaces before application of body and finish coats, except as otherwise specified.

B. Spot prime and apply body coat to damaged and abraded painted surfaces before applying succeeding coats.

C. Additional field applied prime coats over shop or factory applied prime coats are not required except for exterior exposed steel apply an additional prime coat.

D. Prime rabbets for stop and face glazing of wood, and for face glazing of steel.

1.

E. Metals except boilers, incinerator stacks, and engine exhaust pipes:

1. Steel and iron: MPI 108 (High Build Epoxy Marine Coating finish is specified.
2. Zinc-coated steel and iron: MPI 134 (Waterborne Galvanized Primer) MPI 135 (Non-Cementitious Galvanized Primer).
3. Aluminum scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
4. Terne Metal: MPI 79 (Marine Alkyd Metal Primer)
5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying Metal Primer).
6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel).
7. Asphalt coated metal: MPI 1 (Aluminum Paint).
8. Metal over 94 degrees C (201 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating).

F. Gypsum Board:

1. Surfaces scheduled to have MPI 53 (Interior Latex, Flat) , MPI Gloss Level 1 MPI 52 (Interior Latex, MPI Gloss Level 3) MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) MPI 114 (Interior Latex, Gloss) finish: Use MPI 53 (Interior Latex, MPI Gloss Level 3).

2. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer) MPI 46 (Interior Enamel Undercoat) in shower and bathrooms.
3. Surfaces scheduled to receive vinyl coated fabric wall covering:
   a. MPI 46 (Interior Enamel Undercoat).
   b. Use MPI 98 (High Build Epoxy Coating)

G. Concrete Masonry Units except glazed or integrally colored and decorative units:
1. MPI 4 (Block Filler) on interior surfaces.
2. Prime exterior surface as specified for exterior finishes.

3.8 **EXTERIOR FINISHES:**

3.9 **INTERIOR FINISHES:**

A. Apply following finish coats over prime coats in spaces or on surfaces specified in Finish legend schedule in drawings.

B. Gypsum Board:
1. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3).
2. Two (2) coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2).
3. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5) or MPI 114 (Interior Latex, Gloss).
4. One (1) coat of MPI 45 (Interior Primer Sealer) plus one (1) coat of MPI 48 (Interior Alkyd Gloss).

C. Masonry and Concrete Walls: not used

D. Miscellaneous:
1. Apply where specified in room finish schedule on drawings.
2. MPI 1 (Aluminum Paint): Two (2) coats of aluminum paint.
3. Existing acoustical units scheduled to be repainted except acoustical units with a vinyl finish:
   a. Clean units free of dust, dirt, grease, and other deterrents to paint adhesion.
   b. Mineral fiber units: One (1) coat of MPI 52 (Interior Latex, MPI Gloss Level 3)

c. Units of organic fiber or other material not having a class A rating: One (1) coat of MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (UL Approved)) Top-Coat (UL Approved)) fire retardant paint.

4. Interstitial floor markings: not used

3.10 **REFINISHING EXISTING PAINTED SURFACES:**

A. Clean, patch and repair existing surfaces as specified under "Surface Preparation". No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, sand smooth and re-finish until surface meets with COR's approval.

B. Remove and reinstall items as specified under "General Workmanship Requirements".

C. Remove existing finishes or apply separation coats to prevent non compatible coatings from having contact.

D. Patched or Replaced Areas in Surfaces and Components: Apply spot prime and body coats as specified for new work to repaired areas or replaced components.

E. Except where scheduled for complete painting apply finish coat over plane surface to nearest break in plane, such as corner, reveal, or frame.

F. In existing rooms and areas where alterations occur, clean existing stained and natural finished wood retouch abraded surfaces and then give entire surface one (1) coat of MPI 71 (Polyurethane, Moisture Cured, Clear Flat).

G. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.

H. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.

I. Sand or dull glossy surfaces prior to painting.

J. Sand existing coatings to a feather edge so that transition between new and existing finish will not show in finished work.

3.11 **PAINT COLOR:**

A. Color and gloss of finish coats is specified in Finish legend schedule in drawings.

B. For additional requirements regarding color see Articles, "REFINISHING EXISTING PAINTED SURFACE" and "MECHANICAL AND ELECTRICAL FIELD PAINTING SCHEDULE".

C. Coat Colors:
   1. Color of priming coat: Lighter than body coat.
   2. Color of body coat: Lighter than finish coat.
   3. Color prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.

D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
   1. Paint to match color of casework where casework has a paint finish.
   2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.12 **MECHANICAL AND ELECTRICAL WORK FIELD PAINTING SCHEDULE:**

A. Field painting of mechanical and electrical consists of cleaning, touching-up abraded shop prime coats, and applying prime, body and finish coats to materials and equipment if not factory finished in space scheduled to be finished.

B. In spaces not scheduled to be finish painted in Finish legend schedule in drawings paint as specified below.

C. Paint various systems specified in Division 02 – EXISTING CONDITIONS, Division 21 – FIRE SUPPRESSION, Division 22 - PLUMBING, Division 23 – HEATING, VENTILATION AND AIR-CONDITIONING, Division 26 - ELECTRICAL, Division 27 - COMMUNICATIONS, and Division 28 – ELECTRONIC SAFETY AND SECURITY.

D. Paint after tests have been completed.

E. Omit prime coat from factory prime-coated items.

F. Finish painting of mechanical and electrical equipment is not required when located in interstitial spaces, above suspended ceilings, in concealed areas such as pipe and electric closets, pipe basements, pipe tunnels, trenches, attics, roof spaces, shafts and furred spaces except on electrical conduit containing feeders 600 volts or more.

G. Omit field painting of items specified in “BUILDING AND STRUCTURAL WORK FIELD PAINTING”; “Building and Structural Work not Painted”.

H. Color:
   1. Paint items having no color specified in Finish legend schedule in drawings to match surrounding surfaces.
   2. Paint colors as specified in Finish legend schedule in drawings except for following:

a. White: Exterior unfinished surfaces of enameled plumbing fixtures. Insulation coverings on breeching and uptake inside boiler house, drums and drum-heads, oil heaters, condensate tanks and condensate piping.
b. Gray: Heating, ventilating, air conditioning and refrigeration equipment (except as required to match surrounding surfaces), and water and sewage treatment equipment and sewage ejection equipment.
c. Aluminum Color: Ferrous metal on outside of boilers and in connection with boiler settings including supporting doors and door frames and fuel oil burning equipment, and steam generation system (bare piping, fittings, hangers, supports, valves, traps and miscellaneous iron work in contact with pipe).
d. Federal Safety Red: Exposed fire protection piping hydrants, post indicators, electrical conducts containing fire alarm control wiring, and fire alarm equipment.
e. Federal Safety Orange: Entire lengths of electrical conduits containing feeders 600 volts or more.
f. Color to match brickwork sheet metal covering on breeching outside of exterior wall of boiler house.

3. Interior Locations:
   a. Apply two (2) coats of MPI 47 (Interior Alkyd, Semi-Gloss) to following items:
      Metal under 94 degrees C (201 degrees F) of items such as bare piping, fittings, hangers and supports.
      Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
      Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
   b. Paint electrical conduits containing cables rated 600 volts or more using two (2) coats of MPI 9 (Exterior Alkyd Enamel) in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.

4. Other exposed locations:
   a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two (2) coats of MPI 1 (Aluminum Paint).

3.13 **BUILDING AND STRUCTURAL WORK FIELD PAINTING:**

A. Painting and finishing of interior and exterior work except as specified here-in-after.
   1. Painting and finishing of new and existing work including colors and gloss of finish selected is specified in Finish Schedule, Finish legend schedule in drawings.
   2. Painting of disturbed, damaged and repaired or patched surfaces when entire space is not scheduled for complete repainting or refinishing.
   3. Painting of ferrous metal and galvanized metal.
   4. Painting of wood with fire retardant paint exposed in attics, when used as mechanical equipment space (except shingles).
   5. Identity painting and safety painting.

B. Building and Structural Work not Painted:
   1. Prefinished items:
      a. Casework, doors, elevator entrances and cabs, metal panels, wall covering, and similar items specified factory finished under other sections.
      b. Factory finished equipment and pre-engineered metal building components such as metal roof and wall panels.
   2. Finished surfaces:
      a. Hardware except ferrous metal.
      b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
      c. Signs, fixtures, and other similar items integrally finished.
   3. Concealed surfaces:
      a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
      b. Inside walls or other spaces behind access doors or panels.
      c. Surfaces concealed behind permanently installed casework and equipment.
   4. Moving and operating parts:

a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
b. Tracks for overhead or coiling doors, shutters, and grilles.

5. Labels:
   a. Code required label, such as Underwriters Laboratories Inc., Intertek Testing Service or Factory Mutual Research Corporation.
   b. Identification plates, instruction plates, performance rating, and nomenclature.
6. Galvanized metal:
   a. Exterior chain link fence and gates, corrugated metal areaways, and gratings.
   b. Gas Storage Racks.
   c. Except where specifically specified to be painted.
7. Metal safety treads and nosings.
8. Gaskets.
9. Structural steel encased in concrete, masonry, or other enclosure.
10. Structural steel to receive sprayed-on fire proofing.
11. Ceilings, walls, columns in interstitial spaces.

3.14 **IDENTITY PAINTING SCHEDULE:**

A. Identify designated service in new buildings or projects with extensive remodeling in accordance with ASME A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels. For existing spaces where work is minor match existing.
   1. Legend may be identified using snap-on coil plastic markers or by paint stencil applications.
   2. Apply legends adjacent to changes in direction, on branches, where pipes pass through walls or floors, adjacent to operating accessories such as valves, regulators, strainers and cleanouts a minimum of 12.2 M (40 feet) apart on straight runs of piping. Identification next to plumbing fixtures is not required.
   3. Locate Legends clearly visible from operating position.
   4. Use arrow to indicate direction of flow using black stencil paint.
   5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert

working pressure shown on construction documents where asterisk appears for High, Medium, and Low Pressure designations as follows:

a. High Pressure - 414 kPa (60 psig) and above.

b. Medium Pressure - 104 to 413 kPa (15 to 59 psig).

c. Low Pressure - 103 kPa (14 psig) and below.

d. Add Fuel oil grade numbers.

6. Legend name in full or in abbreviated form as follows:

PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Green	White	Blow-off
Boiler Feedwater		Green	White	Blr Feed
A/C Condenser Water Supply		Green	White	A/C Cond Wtr Sup
A/C Condenser Water Return		Green	White	A/C Cond Wtr Ret
Chilled Water Supply		Green	White	Ch. Wtr Sup
Chilled Water Return		Green	White	Ch. Wtr Ret
Shop Compressed Air		Blue	White	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Green	White	H.P. _____*
High Pressure Condensate Return		Green	White	H.P. Ret ____*
Medium Pressure Steam		Green	White	M. P. Stm ____*
Medium Pressure Condensate Return		Green	White	M.P. Ret _____*
Low Pressure Steam		Green	White	L.P. Stm _____*
Low Pressure Condensate Return		Green	White	L.P. Ret _____*
High Temperature Water Supply		Green	White	H. Temp Wtr Sup
High Temperature Water Return		Green	White	H. Temp Wtr Ret
Hot Water Heating Supply		Green	White	H. W. Htg Sup
Hot Water Heating Return		Green	White	H. W. Htg Ret
Gravity Condensate Return		Green	White	Gravity Cond Ret
Pumped Condensate Return		Green	White	Pumped Cond Ret
Vacuum Condensate Return		Green	White	Vac Cond Ret

Fuel Oil - Grade		Brown	White	Fuel Oil-Grade
(Diesel Fuel included under Fuel Oil)				
Boiler Water Sampling		Green	White	Sample
Chemical Feed		Green	White	Chem Feed
Continuous Blow-Down		Green	White	Cont. B D
Pumped Condensate		Green	White	Pump Cond
Pump Recirculating		Green	White	Pump-Recirc.
Vent Line		Green	White	Vent
Alkali		Orange	Black	Alk
Bleach		Orange	Black	Bleach
Detergent		Yellow	Black	Det
Liquid Supply		Yellow	Black	Liq Sup
Reuse Water		Yellow	Black	Reuse Wtr
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Ice Water				
Supply	White	Green	White	Ice Wtr
Return	White	Green	White	Ice Wtr Ret
Reagent Grade Water		Green	White	RG
Reverse Osmosis		Green	White	RO
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Chemical Resistant Pipe				
Waste		Orange	Black	Acid Waste
Vent		Orange	Black	Acid Vent
Atmospheric Vent		Green	White	ATV
Silver Recovery		Green	White	Silver Rec
Oral Evacuation		Green	White	Oral Evac
Fuel Gas		Yellow	Black	Gas
Fire Protection Water				
Sprinkler	Red	Red	White	Auto Spr
Standpipe	Red	Red	White	Stand
Sprinkler	Red	Red	White	Drain

Hot Water Supply Dom.

Solar Water	Green	White	H.W. Sup Dom/SW
Hot Water Return Dom.			
Solar Water	Green	White	H.W. Ret Dom/SW

7. Electrical Conduits containing feeders over 600 volts, paint legends using 50 mm (2 inch) high black numbers and letters, showing the voltage class rating. Provide legends where conduits pass through walls and floors and at maximum 6096 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, 5000.
8. See Sections for methods of identification, legends, and abbreviations of the following:
   a. Regular compressed air lines: Section 22 15 00, GENERAL SERVICE COMPRESSED-AIR SYSTEMS.
   b. Dental compressed air lines: not used
   c. Laboratory gas and vacuum lines: not used.
   d. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
   e. Medical Gases and vacuum lines: not used.
   f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 28.33, CONDUITS AND BACKBOXES FOR ELECTRONIC SAFETY AND SECURITY.

B. Fire and Smoke Partitions:
   1. Identify partitions above ceilings on both sides of partitions except within shafts in letters not less than 64 mm (2 1/2 inches) high.
   2. Stenciled message: "SMOKE BARRIER" or, "FIRE BARRIER" as applicable.
   3. Locate not more than 6096 mm (20 feet) on center on corridor sides of partitions, and with a least one (1) message per room on room side of partition.
   4. Use semi-gloss paint of color that contrasts with color of substrate.

C. Identify columns in pipe basements and interstitial space:
   1. Apply stenciled number and letters to correspond with grid numbering and lettering indicated on construction documents.

2. Paint numbers and letters 101 mm (4 inches) high, locate 45 mm (18 inches) below overhead structural slab.
3. Apply on four (4) sides of interior columns and on inside face only of exterior wall columns.
4. Color:
   a. Use black on concrete columns.
   b. Use white or contrasting color on steel columns.

3.15 **PROTECTION CLEAN UP, AND TOUCH-UP:**

A. Protect work from paint droppings and spattering by use of masking, drop cloths, removal of items or by other approved methods.

B. Upon completion, clean paint from hardware, glass and other surfaces and items not required to be painted of paint drops or smears.

C. Before final inspection, touch-up or refinished in a manner to produce solid even color and finish texture, free from defects in work which was damaged or discolored.

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DIVISION 10
SPECIALTIES

ENGINEER

SECTION 10 14 00
SIGNAGE – BIRMIMGHAM VA MEDICAL CENTER

INTERIOR SIGNAGE

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies interior signage for room identification, life safety and directional / wayfinding signs.

1.2 MANUFACTURER'S QUALIFICATIONS

Sign vendor shall provide evidence that they regularly and presently manufacture signs similar to those specified in this section as one of their principal products. Sign vendor shall have at least 5 years' experience, be on GSA Schedule MAS 339950 for re-orders, and have completed 5 other similar VA signage projects within the last 5 years. Specified Vendor: Creative Signage System, Inc. 11460-B Edmonston Road, Beltsville, MD 20705 P: 301-345-3700 E: creative@creativesignage.com.

1.3 SUBMITTALS

A. Manufacturer's Literature:
   1. Showing the methods and procedures proposed for the concealed anchorage of the signage system to each surface type.
   2. Printed specifications, anchorage details, installation and maintenance instructions.
   3. GSA Schedule information showing products and components are listed.

B. Samples: Sign location plan, showing location, type and total number of signs required.

C. Shop Drawings: Scaled for manufacture and fabrication of sign types. Identify materials, show joints, welds, anchorage, accessory items, mounting and finishes.

D. Certification of meeting environmental attributes required within specification.

E. Physical sample of sign type D1A/F/W with bid submittal.

F. Certification of variable dot UV printing for color and graphics.

1.4 DELIVERY AND STORAGE

A. Deliver materials to job in manufacturer's original sealed containers with brand name marked thereon. Protect materials from damage.

B. Package to prevent damage or deterioration during shipment, handling, storage and installation. Maintain protective covering in place and in good repair until removal is necessary.

C. Deliver signs only when the site and mounting services are ready for installation work to proceed.

D. Store products in dry condition inside enclosed facilities.

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. American Society for Testing and Materials (ASTM):

B209-21.....Aluminum and Aluminum-Alloy Sheet and Plate

B221-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and tubes.

C. Federal Specifications (Fed Spec):

MIL-PRF-8184F.....Plastic Sheet, Acrylic, Modified.

MIL-P-46144C.....Plastic Sheet, Polycarbonate

1.6 MINIMUM SIGN REQUIREMENTS

A. Permanent Rooms and Spaces (Refer to Birmingham VA Medical Center Sign Standard Drawings):

1. Tactile and Braille Characters, raised minimum 0.793 mm (1/32 in). Characters shall be accompanied by Grade 2 Braille.
2. Type Styles: See Drawings.
3. Character Height: Minimum 16 mm (5/8 in) high, Maximum 50 mm (2 in).
4. Symbols (Pictograms): Equivalent written description shall be placed directly below symbol, outside of symbol's background field. Border dimensions of symbol background shall be minimum 150 mm (6 in) high.
5. Finish and Contrast: Signs shall be 2 ply construction non-glare acrylic finish with adequate contrast. Refer to Drawing Standards for Approved Design.

6. Mounting Location and Height: To comply with ADA Regulations. Mount on wall adjacent to the latch side of the door and to avoid door swing and protruding objects.
7. Aluminum frame is clear anodized with a minimum of 75% recycled aluminum content.
8. All wall mounted signs must be mechanically fastened to the wall with concealed screws and plugs.
9. Acrylic sign components holding inserts must be magnetically mounted allowing sign messages to be easily slid out and changed.
10. Insert software program with unlimited license that auto scales the copy to fit each sign approximately allowing signs to be updated in house on any standard computer and printer must be provided.
11. Background color, non-tactile copy and graphics shall be subsurface digitally printed direct to substrate with variable dot pattern, UV ink containing NO VOCs and LED curing. Painting and screen printing shall not be used.

B. Overhead Signs (Refer to Birmingham VA Medical Center Sign Standard Drawings):
1. Type Styles: As shown. Characters shall have a width-to-height ratio between 3:5 and 1:1. Characters shall have a stroke width-to-height ratio of between 1:5 and 1:10.
2. Character Height: minimum 75 mm (3 in) high for overhead signs. As shown, for directional signs.
3. Finish and Contrast: Same as for signs of permanent rooms and spaces.
4. Mounting Location and Height: As shown.
5. Background color, non-tactile copy and graphics shall be subsurface digitally printed direct to substrate with variable dot pattern, UV ink containing NO VOCs and LED curing. Painting and screen printing shall not be used.

1.7 COLORS AND FINISHES:

All acrylic shall be 2-Ply Non-Glare. Metal accents shall be anodized aluminum with 75% recycled content. Sign backing to be an

Environmental Preferable Product (EPP Downstream Certified). Overhead Signage shall feature a 2" Solid Wood Header to match wood accents. Life Safety Signage color Fire Red Background with White Copy & Graphics. Final color and finishes - Refer to Birmingham VA Medical Center Standard Drawings.

1.8 REPLACEMENT AVAILABILITY

All products designed must be readily available non-proprietary items on GSA Schedule MAS 339950 for ease in future procurement. All signs must be American made and under standard GSA warranties.

PART 2 - PRODUCTS

2.1 GENERAL

A. Signs of type, size and design shown on the drawings and as specified.
B. Signs complete with lettering, framing and related components for a complete installation.
C. Provide graphics items as completed units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.
D. Do not scale drawings for dimensions. Contractor to verify and be responsible for all dimensions and conditions shown by these drawings. COR to be notified of any discrepancy in drawing, in field directions or conditions, and/or of any changes required for all such construction details.

2.2 PRODUCTS

A. Aluminum:
   1. Sheet and Plate: ASTM B209.
   2. Extrusions and Tubing: ASTM B221.
B. Cast Acrylic Sheet: MIL-PRF-8184F; Type II, class 1, Water white non-glare optically clear. Matte finish water white clear acrylic shall not be acceptable.
C. Polycarbonate: MIL-P-46144C; Type I, class 1.

D. Vinyl: 0.1 mm thick machine cut, having a pressure sensitive adhesive and integral colors.

2.3 SIGN STANDARDS

A. Topography:

1. Type Style: Helvetica Medium and Futura. Initial caps or all caps as indicated in Sign Message Schedule.
2. Arrow: See graphic standards in drawings.
3. Letter spacing: See graphic standards on drawings.
4. Letter spacing: See graphic standards on drawings.
5. All text, arrows, and symbols to be provided in size, colors, typefaces and letter spacing shown. Text shall be a true, clean, accurate reproduction of typeface(s) shown. Text shown in drawings are for layout purposes only; final text for signs is listed in Sign Message Schedule.

2.4 CONSTRUCTION

Interior signs - are composed of a two ply construction, the first ply being 1/16" thick matte finish acrylic, the second ply being 4mm thick closed cell PVC, and the laminate adhesive being a double coated pressure sensitive polypropylene film rated at 56 oz/in minimum adhesion per PSTC-1.Pocket signs created using No. 38 -.080” separating rib(s) to form insert space for custom computer generated acetate **(the use of adhesive strips instead of acrylic is not acceptable).** Signs to nest into Type OS22 custom extruded, precision mitered, aluminum frame composed of clear anodized **aluminum with a minimum of 75% recycled content.** Frame is to be assembled with a two part epoxy process using **composite board back plate made of recycled content and EPP Downstream Certified.** The room number portion to use injected molded ABS characters. Grade II Braille to be produced with high pressure surface beading directly below tactile number 3/16” minimum. Braille translation via Duxbury Braille translator. **Wood accents shall be fabricated from multi-layered fire retardant thermo-plastic sheet with a class A decorative embossed film in the finish specified. Color and graphics shall be subsurface digitally printed direct to substrate with**

a variable dot pattern, UV Ink containing NO VOCs and LED curing. Painting, screen printing, and laminates shall not be used. Surface color or copy is not acceptable unless required for ADA compliance.

2.5 FABRICATION

A. Design components to allow for expansion and contraction for a minimum material temperature range of 56 °C (100 °F), without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.

B. Form work to required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever and wherever possible.

C. Shop fabricate so far as practicable. Joints fastened flush to conceal reinforcement, or welded where thickness or section permits.

D. Contact surfaces of connected members be true. Assembled so joints will be tight and practically unnoticeable, without use of filling compound.

E. Signs shall have fine, even texture and be flat and sound. Lines and miters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces be smooth flat and without oil-canning, free of rack and twist. Maximum variation from plane of surface plus or minus 0.3 mm (0.015 inches. Restore texture to filed or cut areas.

F. Level or straighten wrought work. Members shall have sharp lines and angles and smooth su1rfaces.

G. Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.

H. Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.

I. Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly mitered to give appearance of solid material.

J. All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.

K. Movable parts, including hardware, are be cleaned and adjusted to operate as designed without binding of deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.

L. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.

M. No signs are to be manufactured until final sign message schedule and location review has been completed by the COR & forwarded to contractor.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Protect products against damage during field handling and installation.

B. Mount signs in proper alignment, level and plumb according to the sign location plan and the dimensions given on elevation and sign location drawings. Where otherwise not dimensioned, signs shall be installed where best suited to provide a consistent appearance throughout the project. When exact position, angle, height or location is in doubt, contact COR for clarification.

C. All wall mounted signs must be mechanically fastened to the wall unless noted as an exception.

D. Remove or correct signs or installation work COR determines as unsafe or as an unsafe condition.

- - - END - - -

SECTION 10 26 00
WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies wall guards, handrail/wall guard combinations, corner guards and door/door frame protectors and high impact wall covering.

1.2 RELATED WORK

A. Section 01 81 13, SUSTAINABLE CONSTRUCTION REQUIREMENTS: Sustainable Design Requirements.

B. Section 05 50 00, METAL FABRICATIONS: Structural Steel Corner Guards.

C. Section 08 71 00, DOOR HARDWARE: Armor plates and kick plates not specified in this section.

1.3 QUALITY ASSURANCE

A. Manufacturer’s Qualifications: Manufacturer with a minimum of three (3) years’ experience in providing items of type specified.

1. Obtain wall and door protection from single manufacturer.

B. Installer’s Qualifications: Installers are to have a minimum of three (3) years’ experience in the installation of units required for this project.

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. 1. Volatile organic compounds per volume as specified in PART 2 - PRODUCTS.

C. Shop Drawings: show design and installation details.

D. Manufacturer's Literature and Data:

1. Handrail/Wall Guard Combinations.
2. Wall Guards.
3. Corner Guards.
4. Door/Door Frame Protectors.
5. High Impact Wall covering.

E. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

F. Manufacturer's qualifications.

G. Installer's qualifications.

H. Manufacturer's warranty.

1.5 DELIVERY AND STORAGE

A. Deliver materials to the site in original sealed packages or containers marked with the name and brand, or trademark of the manufacturer.

B. Protect from damage from handling and construction operations before, during and after installation.

C. Store in a dry environment of approximately 21 degrees C (70 degrees F) for at least 48 hours prior to installation.

1.6 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21 "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their wall and door protection for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

1.7 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):

A240/A240M-23a.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and For General Applications

B221-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

B221M-21.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

D256-23e1.....Determining the Izod Pendulum Impact Resistance of Plastics

D635-22.....Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position

E84-22.....Surface Burning Characteristics of Building Materials

C. Aluminum Association (AA):

DAF 45-09.....Designation System for Aluminum Finishes

D. American Architectural Manufacturers Association (AAMA):

611-14.....Voluntary Specification for Anodized Architectural Aluminum

E. Code of Federal Regulation (CFR):

40 CFR 59(2020) Subpart D National Volatile Organic Compound Emission Standards for Architectural Coatings

F. The National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500-06.....Metal Finishes Manual

G. National Fire Protection Association (NFPA):

80-2022.....Standard for Fire Doors and Other Opening Protectives

H. SAE International (SAE):

J 1545-2021.....Instrumental Color Difference Measurement for Exterior Finishes, Textiles and Colored Trim.

I. Underwriters Laboratories Inc. (UL):

Annual Issue.....Building Materials Directory

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: A240/A240M, Type 304.

B. Aluminum Extruded: ASTM B221M (B221), Alloy 6063, Temper T5 or T6. Provide aluminum alloy used for colored anodizing coating as required to produce specified color.

C. Resilient Material:

1. Provide resilient material consisting of high impact resistant extruded acrylic vinyl, polyvinyl chloride, or injection molded thermal plastic conforming to the following:

a. Minimum impact resistance of 960.8 N-m/m (18 feet-pounds/square inch) when tested in accordance with ASTM D256 (Izod impact, feet-pounds per inch notched).

b. Class 1 fire rating when tested in accordance with ASTM E84, having a maximum flame spread of 25 and a smoke developed rating of 450 or less.
c. Rated self-extinguishing when tested in accordance with ASTM D635.
d. Provide material labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.
e. Provide resilient material for protection on fire rated doors and frames assemblies that is listed by the testing laboratory performing the tests.
f. Provide resilient material installed on fire rated wood/steel door and frame assemblies that have been tested on similar type assemblies. Test results of material tested on any other combination of door and frame assembly are not acceptable.
g. Provide integral color with colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.

2.2 CORNER GUARDS

A. Resilient, Shock-Absorbing Corner Guards: Flush mounted Surface mounted type.
1. snap-on corner guard formed from resilient material, minimum 1.98 mm (0.078-inch) thick, free floating on a continuous 1.52 mm (0.060-inch) thick extruded aluminum retainer. Retainer used for flush mounted type to act as a stop for adjacent wall finish material. Provide appropriate mounting hardware, cushions and base plates as required.
2. Profile: Minimum 50 mm (2 inch) long leg and 6 mm (1/4 inch) corner radius 76 mm (3 inch) long leg and 6 mm (1/4 inch) corner radius 76 mm (3 inch) long leg and 32 mm (1-1/4 inch) corner radius .
3. Height: 1.22 m (4 feet) 2.43 m (8 feet).
4. Retainer Clips: Provide manufacturer’s standard impact-absorbing clips.
5. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.

6. Flush mounted corner guards installed on any fire rated wall to be installed in a manner that maintains the fire rating of the wall. Provide fire test of proposed corner guard system to verify compliance.
   a. Where insulating materials are an integral part of the corner guard system, provide insulating materials furnished by the manufacturer of the corner guard system.

B. Fabricate stainless steel corner guards of 1.27 mm (.05 inch) thick material conforming to ASTM A240/A240M, Type 302 304 . Install corner guards from floor to ceiling as indicated on construction documents. Form corner guard to dimensions shown on construction documents.

2.3 WALL GUARDS AND HANDRAILS

A. Resilient Wall Guards and Handrails:
   1. Handrail/Wall Guard Combination:
      a. Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick.
      b. Free-floating on a continuous, extruded aluminum retainer, minimum 1.82 mm (0.072-inch) thick.
      c. Anchor to wall at maximum 762 mm (30 inches) on center.
   2. Wall Guards:
      a. Snap-on covers of resilient material, minimum 2.54 mm (0.100-inch) thick. free-floated over a continuous extruded aluminum retainer, minimum 2.03 mm (0.080-inch) thick anchored to wall at maximum 610 mm (24 inches) on center.
   3. Provide handrails and wall guards with prefabricated end closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners to be field adjustable to assure close alignment with handrails and wall guards. Screw or bolt closure caps to aluminum retainer in a concealed manner.

2.4 DOOR AND DOOR FRAME PROTECTION

A. Fabricate door and door frame protection items from vinyl acrylic or polyvinyl chloride resilient material, minimum 1.52 mm (0.060-inch) thick, for doors and 0.89 mm (0.035-inch) thick for door frames .

B. Provide adhesive as recommended by resilient material manufacturer.

2.5 HIGH IMPACT WALL COVERING

A. Provide wall covering/panels consisting of high impact rigid acrylic vinyl or polyvinyl chloride resilient material.

B. Panel sizes to be 0.61 x 1.21 meter (2 x 4 feet).

C. Submit fire rating and extinguishing test results for resilient material.

D. Submit statements attesting that the items comply with specified fire and safety code requirements.

E. Rigid Vinyl Acrylic Wall Covering: Wall covering thickness to be 0.56 mm (0.022 inch) 0.71 mm (0.028 inch) 1.02 mm (0.040 inch) 1.52 mm (0.060 inch).

F. High Impact Wall Panels: Wall panel face and edge thickness to be 0.56 mm (0.022 inch). Panel face to be factory banded to a 9.53 mm (0.375 inch) thick fiberboard core. The backside of the panel is to be laminated with a moisture resistant vapor barrier.

G. Provide adhesive as recommended by the wall covering manufacturer. Provide adhesive with VOC content of 250 g/L or less when calculated according to 40 CFR 59, (EPA Method 24).

2.6 FASTENERS AND ANCHORS

A. Provide fasteners and anchors as required for each specific type of installation.

B. Where type, size, spacing or method of fastening is not shown or specified in construction documents, submit shop drawings showing proposed installation details.

2.7 FINISH

A. Aluminum: In accordance with AA DAF-45.

1. Exposed aluminum: AAMA 611 AA-M12C22A31 chemically etched medium matte, with clear anodic coating, Class II Architectural, .01 mm (0.4 mil) thick.
2. Concealed aluminum: Mill finish as fabricated, uniform in color and free from surface blemishes.

B. Stainless Steel: In accordance with NAAMM AMP 500 finish Number 4.

C. Resilient Material: Embossed textures and color in accordance with SAE J1545.

PART 3 - INSTALLATION

3.1 RESILIENT CORNER GUARDS

A. Install corner guards on walls in accordance with manufacturer's instructions.

3.2 STAINLESS STEEL CORNER GUARDS

A. Mount guards on external corners of interior walls, partitions and columns as shown on construction documents.

B. Where corner guards are installed on walls, partitions or columns finished with plaster or ceramic tile, anchor corner guards as shown on construction documents. Coat back surfaces of corner guards, where shown on construction documents, with a non-flammable, sound deadening material. Corner guards to overlap finish plaster surfaces.

C. Where corner guards are installed on exposed structural glazed facing tile units or masonry wall, partitions or columns, anchor corner guards as shown on the construction documents.

D. Where corner guards are installed on gypsum board, clean surface and anchor guards with a neoprene solvent-type contact adhesive specifically manufactured for use on gypsum board construction. Remove excess adhesive from around edge of guard and allow curing undisturbed for 24 hours.

3.3 RESILIENT WALL GUARD HANDRAIL COMBINATION

A. Secure guards to walls with mounting cushions brackets and fasteners in accordance with manufacturer's details and instructions.

3.4 ALUMINUM WALL GUARDS

3.5 STAINLESS STEEL WALL GUARDS

3.6 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING

A. Surfaces to receive protection to be clean, smooth and free of obstructions.

B. Install protectors after frames are in place but preceding installation of doors in accordance with approved shop drawings and manufacturer’s specific instructions.

C. Apply with adhesive in controlled environment according to manufacturer’s recommendations.

D. Protection installed on fire rated doors and frames to be installed according to NFPA 80 and installation procedures listed in UL Building

Materials Directory; or, equal listing by other approved independent testing laboratory establishing the procedures.

- - - E N D - - -

SECTION 10 28 00
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 DESCRIPTION

A. SUMMARY:

1. Section Includes: Toilet and bath accessories at dressing rooms, toilets, baths, locker rooms and other areas indicated on drawings.

1.2 RELATED WORK

A. Color of finishes-as shown on drawings.

B. Section 09 30 13, CERAMIC/PORCELAIN TILING: Ceramic Toilet and Bath Accessories.

C. Section 10 21 23, CUBICLE CURTAIN TRACKS:Shower Curtain Break Away Pendant Chain Hooks.

1.3 APPLICABLE PUBLICATIONS

A. Comply with references to extent specified in this section.

B. American Society of Mechanical Engineers (ASME):

1. B18.6.4-98(R2005) Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws inch.

C. American Welding Society (AWS):

D10.4-2023.....Welding Austenitic Chromium-Nickle Stainless Steel Piping and Tubing.

D. ASTM International (ASTM):

A269/A269M-22.....Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

A312/A312M-22.....Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

A653/A653M-22.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

A666-22.....Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

A1011/A1011M-22.....Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy,

High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.

B30-20.....Copper Alloys in Ingot Form.

B75/B75M-20.....Seamless Copper Tube.

B221-22.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

B221M-22.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).

B456-17.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

B824-17.....General Requirements for Copper Alloy Castings.

C1036-21.....Flat Glass.

C1048-18.....Heat-Strengthened and Fully Tempered Flat Glass.

D635-22.....Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

F446-19.....Grab Bars and Accessories Installed in the Bathing Area.

E. Federal Specifications (Fed. Spec.):

A-A-3002.....Mirror, Glass.

FF-S-107C(2).....Screws, Tapping and Drive.

WW-P-541/8B(1).....Plumbing Fixtures (Accessories, Land Use).

F. National Architectural Metal Manufacturers(NAAMM):

AMP 500-06.....Metal Finishes Manual.

1.4 SUBMITTALS

A. Submittal Procedures: Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.

B. Submittal Drawings:

1. Show size, configuration, and fabrication, anchorage and installation details.
2. Show mounting locations and heights.

C. Manufacturer's Literature and Data:

1. Description of each product.
2. Installation instructions.

D. Samples:

1. Full sized, complete assembly of each product specified.

2. Approved samples may be incorporated into project.

E. Certificates: Certify each product complies with specifications.

1. Soap dispensers: Certify soap dispensers are fabricated of material that will not be affected by liquid soap, aseptic detergents, and hexachlorophene solutions.

F. Qualifications: Substantiate qualifications comply with specifications.

1. Manufacturer.

G. Operation and Maintenance Data:

1. Care instructions for each exposed finish product.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Regularly manufactures specified products.

1.6 DELIVERY

A. Deliver products in manufacturer's original sealed packaging.

B. Mark packaging, legibly. Indicate manufacturer's name or brand, type, color, production run number, and manufacture date.

C. Before installation, return or dispose of products within distorted, damaged, or opened packaging.

1.7 STORAGE AND HANDLING

A. Store products indoors in dry, weathertight facility.

B. Protect products from damage during handling and construction operations.

1.8 WARRANTY

A. Construction Warranty: FAR clause 52.246-21, "Warranty of Construction."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B221M (ASTM B221), Alloy 6063-T5 and Alloy 6463-T5.

B. Stainless Steel:

1. Plate Or Sheet: ASTM A666, Type 304, 0.8 mm (0.031 inch) thick unless otherwise specified.

2. Tubing: ASTM A269/A269M, Grade TP 304, seamless or welded.

3. Pipe: ASTM A312/A312M; Grade TP 304.

C. Steel Sheet: ASTM A653/A653M, zinc-coated (galvanized) coating designation G90.

D. Chrome Plating (Service Condition Number SC 2): ASTM B456.

E. Brass Castings: ASTM B30.

F. Copper:

1. Tubing: ASTM B75/B75M.
2. Castings: ASTM B824.

G. Glass:

1. ASTM C1036, Type 1, Class 1, Quality q2, for mirrors, and for mirror doors in medicine cabinets.
2. ASTM C1036, Type 1 Class 1 Quality q3, for shelves in medicine cabinets.
3. ASTM C1048, Kind FT, Condition A, Type 1, Class 1 for glass and mirrors in Mental Health and Behavior Patient Care Units, and Security Examination Rooms.

2.2 PRODUCTS - GENERAL

A. Basis of Design: as shown on drawings.

B. Provide each product from one manufacturer.

C. Products Used Within Mental Health and Behavioral Patient Care Units:

1. Provide accessories free of anchor points.
2. Design accessories for attachment with tamper resistant hardware.

2.3 PAPER TOWEL DISPENSERS

A. Surface mounted type with sloping top.

B. Dispensing capacity for 300 sheets of any type of paper toweling.

C. Fabricate of stainless steel.

D. Provide door with continuous hinge at bottom, and spring tension cam lock or tumbler lock, keyed alike, at top, and refill sight slot in front.

2.4 COMBINATION PAPER TOWEL DISPENSER AND DISPOSAL UNITS

A. semi-recessed type.

B. Dispensing capacity for 400 sheets of any type of paper toweling.

C. Fabricate of stainless steel.

D. Form face frames, from one piece.

E. Provide each door with continuous stainless steel piano hinge and tumbler lock, keyed alike.

F. Provide removable waste receptacle approximately 40 L (10.5 gal.) capacity, fabricated of 0.45 mm (0.02 inch) thick stainless steel.

2.5 WASTE RECEPTACLES

A. Semi-recessed type, without doors. Fed. Spec. WW-P-541, Type II.

B. Fabricate of stainless steel.

C. Form face frame from one piece.

D. Provide removable waste receptacle of approximately 45 L (12 gal.) capacity, fabricated of stainless steel.

E. Waste receptacle key locked in place.

2.6 TOILET TISSUE DISPENSERS

A. Double roll surface mounted type.

B. Mount on continuous backplate.

C. Removable spindle ABS plastic or chrome plated plastic.

D. Wood rollers are not acceptable.

E. Toilet Tissue Dispensers Used In Mental Health And Behavioral Patient Care Units: Soft plastic rod incapable of supporting load greater than 22.6 kg (50 pounds) with concealed or tamper resistant fasteners.

2.7 GRAB BARS

A. Fed. Spec. WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and complying with ASTM F446.

B. Fabricate from stainless steel or nylon coated steel, use one type throughout project:

1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
2.

C. Mounting:

1. Floor Mounted Grab Bars: Exposed type.
2. Swing Up Grab Bars: Exposed type.
3. Other Types and Locations: Concealed type.

D. Bars:

1. Fabricate to 38 mm (1-1/2 inch) outside diameter.
   a. Stainless steel, minimum 1.2 mm (0.05 inch) thick.
   b. Nylon coated bars, minimum 1.5 mm (0.06 inch) thick.
2. Fabricate in one continuous piece with ends turned toward walls.

a. Swing up grab bars and grab bars continuous around three sides of showers may be fabricated in two sections, with concealed slip joint between.

3. Continuously weld intermediate support to grab bar.
4. Swing Up Bars: Manually operated; designed to prevent bar from falling when in raised position.

E. Flange for Concealed Mounting:
1. Minimum 2.65 mm (0.1 inch) thick, maximum 79 mm (3-1/8 inch) diameter by 13 mm (1/2 inch) deep, with minimum three set screws for securing flange to back plate.
2. Insert grab bar through center of flange and continuously weld perimeter of grab bar flush to back side of flange.
3. In lieu of providing flange for concealed mounting, and back plate as specified, grab bar may be welded to back plate covered with flange.

F. Flange for Exposed Mounting:
1. Minimum 5 mm (3/16 inch) thick, maximum 79 mm (3-1/8 inch) diameter.
2. Insert grab bar through flange and continuously weld perimeter of grab bar flush to backside of flange.
3. Where mounted on toilet partitions, provide three equally spaced, countersunk holes, sized to accommodate 5 mm (3/16 inch) diameter bolts.
4. Where mounted on floor, provide four equally spaced holes, sized to accommodate 5 mm (3/8 inch) diameter bolts, maximum 5 mm (3/8 inch) from edge of flange.

G. Back Plates:
1. Minimum 2.65 mm (0.1046 inch) thick metal.
2. Fabricate in one piece, maximum 6 mm (1/4 inch) deep, with diameter sized to fit flange. Provide slotted holes to accommodate anchor bolts.
3. Provide spreaders, through bolt fasteners, and cap nuts, where grab bars are mounted on partitions.

H. Grab bars in Mental Health and Behavioral Patient Care Units: Provide units complying with accessibility standards, but preventing materials from being threaded between bar and wall as possible anchor point.

2.8 SHOWER CURTAIN RODS

2.9 CLOTHES HOOKS, ROBE OR COAT

A. Fabricate hook units from chromium plated brass with satin finish, or stainless steel, using 6 mm (1/4 inch) minimum thick stock, with edges and corners rounded smooth to thickness of metal, or 3 mm (1/8 inch) minimum radius.

B. Fabricate each unit as a double hook on a single shaft, integral with or permanently fastened to wall flange, provided with concealed fastenings.

C. Clothes Hooks Used In Mental Health And Behavioral Patient Care Units: Provide units free of anchor points and secured to the wall using tamper resistant hardware.

2.10 TOWEL BARS

2.11 METAL FRAMED MIRRORS

A. Fed. Spec. A-A-3002 metal frame; stainless steel.

B. Mirror Glass:

1. Minimum 6 mm (1/4 inch) thick.
2. Set mirror in a protective vinyl glazing tape.

C. Frames:

1. Channel or angle shaped section with face of frame minimum 9 mm (3/8 inch) wide. Fabricate with square corners.
2. Metal Thickness 0.9 mm (0.035 inch).
3. Filler:
   a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers contoured to conceal void between back of mirror and wall surface.
   b. Fabricate fillers from same material and finish as mirror frame.
4. Attached Shelf for Mirrors:
   a. Fabricate shelf of same material and finish as mirror frame.
   b. Make shelf maximum 150 mm (6 inches) in depth, and extend full width of mirror.
   c. Close ends and front edge of shelf to same thickness as mirror frame width.

d. Form shelf for aluminum framed mirror as integral part of bottom frame member.

e. Form stainless steel shelf with concealed brackets to attach to mirror frame.

D. Back Plate:

1. Fabricate backplate for concealed wall hanging from zinc-coated, or cadmium plated 0.9 mm (0.036 inch) thick sheet steel, die cut to fit face of mirror frame.
2. Provide set screw type theft resistant concealed fastening system for mounting mirrors.

E. Mounting Bracket:

1. Designed to support mirror tight to wall.
2. Designed to retain mirror with concealed set screw fastenings.

F. Metal Framed Mirrors used in Mental Health and Behavioral Patient Care Units: Provide shatter proof glass or polished stainless steel units.

2.12 MEDICINE CABINETS

2.13 FOOT OPERATED SOAP DISPENSER

2.14 SOAP DISHES

2.15 PAPER CUP DISPENSER

2.16 MOP RACKS

A. Minimum 1016 mm (40 inches) long with five holders.

B. Clamps:

1. Minimum of 1.3 mm (0.05 inch) thick stainless steel bracket retaining channel with hard rubber serrated cam; pivot mounted to channel.
2. Clamps to hold handles from 13 mm (1/2 inch) minimum to 32 mm (1-1/4 inch) maximum diameter.

C. Support:

1. Minimum 1 mm (0.04 inch) thick stainless steel hat shape channel to hold clamps away from wall as indicated.
2. Drill wall flange for 3 mm (1/8 inch) fasteners above and below clamp locations.

D. Secure clamps to support with oval head machine screws or rivets into continuous reinforcing back of clamps.

2.17 STAINLESS STEEL SHELVES (TYPE 44)

A. Shelves:

1. Fabricate shelves of 1.2 mm (0.0478 inch) thick sheet to size and design indicated on Drawings.
2. Fabricate shelves of hollow metal type construction, forming a depressions indicated, with closed fronts, backs, ends and bottoms. Reinforce shelves with 1.2 mm (0.05 inch) thick sheet steel hat channel stiffeners, full depth, welded to underside of top at bracket locations.
3. Miter cuts, where made at corners of shelves, continuously welding.

B. Form brackets of 3 mm (1/8 inch) thick steel as shown. Drill brackets for 6 mm (1/4 inch) anchor bolts.

C. Weld or Screw brackets to shelves.

2.18 STAINLESS STEEL SHELVES(TYPES 45, 45C)

2.19 STAINLESS STEEL SHELVES AT WHEELCHAIR LAVATORY

2.20 FABRICATION - GENERAL

A. Welding, AWS D10.4.

B. Grind, dress, and finish welded joints to match finish of adjacent surface.

C. Form exposed surfaces from one sheet of stock, free of joints.

D. Provide steel anchors and components required for secure installation.

E. Form flat surfaces without distortion. Keep exposed surfaces free from scratches and dents. Reinforce doors to prevent warp or twist.

F. Isolate aluminum from dissimilar metals and from contact with building materials as required to prevent electrolysis and corrosion.

G. Hot-dip galvanized steel or stainless steel, anchors and fastening devices.

H. Shop assemble accessories and package with components, anchors, fittings, fasteners and keys.

I. Key items alike.

J. Provide templates and rough-in measurements.

K. Round and deburr edges of sheets to remove sharp edges.

2.21 FINISH

A. Steel Paint Finish:

1. Powder-Coat Finish: Manufacturer's standard two-coat finish system consisting of the following:
   a. One coat primer.
   b. One coat thermosetting topcoat.
   c. Dry-film Thickness: 0.05 mm (2 mils) minimum.
   d. Color: Refer to drawings.

B. Nylon Coated Steel: Nylon coating powder formulated for fluidized bonding process to steel to provide hard smooth, medium gloss finish, minimum 0.3 mm (0.012 inch) thick, rated as self-extinguishing when tested according to ASTM D635.

C. Stainless Steel: NAAMM AMP 500; No. 4 polished finish.

D. Aluminum Anodized Finish: NAAMM AMP 500.
   1. Clear Anodized Finish: AA-C22A41; Class I Architectural, 0.018 mm (0.7 mil) thick.
   2. Color Anodized Finish: AA-C22A42 or AA-C22A44; Class I Architectural, 0.018 mm (0.7 mil) thick.

E. Chromium Plating: ASTM B456, satin or bright as specified, Service Condition No. SC2.

2.22 ACCESSORIES

A. Fasteners:
   1. Fasteners in Mental Health and Behavioral Patient Care Units: Tamper resistant hot-dipped galvanized or stainless steel.
   2. Exposed Fasteners: Stainless steel or chromium plated brass, finish to match adjacent surface.
   3. Concealed Fasteners:
      a. Shower, Bath Tubs, and High Moisture Areas: Stainless steel.
      b. Other Locations: Steel, hot-dipped galvanized.
   4. Toggle Bolts: For use in hollow masonry or frame construction.
   5. Sex bolts: For through bolting on thin panels.
   6. Expansion Shields: Lead or plastic for solid masonry and concrete substrate as recommended by accessory manufacturer to suit application.
   7. Screws:
      a. ASME B18.6.4.
      b. Fed. Spec. FF-S-107, Stainless steel Type A.

B. Adhesive: As recommended by manufacturer to suit application.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine and verify substrate suitability for product installation.
   1. Verify blocking to support accessories is installed and located correctly.
B. Verify location of accessories with Contracting Officer's Representative.
C. Provide labor or prep as required for VA-furnished and contractor installed or VA-furnished and installed components.

3.2 INSTALLATION

A. Install products according to manufacturer's instructions and approved submittal drawings.
   1. When manufacturer's instructions deviate from specifications, submit proposed resolution for Contracting Officer's Representative consideration.
B. Install grab bars according to ASTM F446.
C. Set work accurately, in alignment and where indicated, parallel or perpendicular as required to line and plane of surface. Install accessories plumb, level, free of rack and twist.
D. Toggle bolt to steel anchorage plates in frame partitions and hollow masonry. Expansion bolt to concrete or solid masonry.
E. Install accessories to function as designed. Perform maintenance service without interference with performance of other devices.
F. Position and install dispensers, and other devices in countertops, clear of drawers, permitting ample clearance below countertop between devices, and ready access for maintenance.
G. Align mirrors, dispensers and other accessories even and level, when installed in battery.
H. Install accessories to prevent striking by other moving, items or interference with accessibility.

I. Install accessories in Mental Health and Behavioral Units with tamper resistant screws that are flush mounted so that they will not support a rope or material for hanging.

3.3 CLEANING

A. After installation, clean toilet accessories according to manufacturer's instructions.

3.4 PROTECTION

A. Protect accessories from damage until project completion.

3.5 SCHEDULE OF ACCESSORIES

Item	Description	Mounting	Material

- - E N D - -

08-01-18

SECTION 10 44 13
FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 DESCRIPTION

This section covers recessed fire extinguisher cabinets.

1.2 RELATED WORK

A. Acrylic glazing: Section 08 80 00, GLAZING.

B. Field Painting: Section 09 91 00, PAINTING.

1.3 SUBMITTALS

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

B. Manufacturer's Literature and Data: Fire extinguisher cabinet including installation instruction and rough opening required.

1.4 APPLICATION 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 of Testing and Materials (ASTM):

D4802-16.....Poly (Methyl Methacrylate) Acrylic Plastic Sheet

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHER CABINET

Recessed type with flat trim of size and design shown.

2.2 FABRICATION

A. Form body of cabinet from 0.9 mm (0.0359 inch) thick sheet steel.

B. Fabricate door and trim from 1.2 mm (0.0478 inch) thick sheet steel with all face joints fully welded and ground smooth.

1. Glaze doors with 6 mm (1/4 inch) thick ASTM D4802, clear acrylic sheet, Category B-1, Finish 1.
2. Design doors to open 180 degrees.
3. Provide continuous hinge, pull handle, and adjustable roller catch.

2.3 FINISH

A. Finish interior of cabinet body with baked-on semigloss white enamel.

B. Finish door, frame with manufacturer's standard baked-on prime coat suitable for field painting.

PART 3 - EXECUTION

A. Install fire extinguisher cabinets in prepared openings and secure in accordance with manufacturer's instructions.

B. Install cabinet so that the extinguisher height within meets the requirements of NFPA 10

- - - E N D - - -

DIVISION 12
FURNISHINGS

08-01-17

SECTION 12 24 00
WINDOW SHADES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. This section includes cloth shades, vertical blinds and venetian blinds. Provide window shades complete, including brackets, fittings and hardware.

1.2 RELATED WORK:

A. Color of shade cloth: to match existing.

B. Lightproof Shades: Section 12 24 21, LIGHTPROOF SHADES.

1.3 QUALITY ASSURANCE:

A. Manufacturer's Qualification: Submit evidence that the manufacture has a minimum of three (3) years' experience in providing item of type specified, and that the blinds have performed satisfactorily on similar installations. Submit qualifications.

B. Submit qualifications for installers who are trained and approved by manufacturer for installation of units provided.

C. Electrical Requirements:

1. NFPA 70 Article 100.
2. Listed and labeled in accordance with UL 325.
3. Marked for intended use, and tested as a system.
4. Individual testing of components is not acceptable in lieu of system testing.

1.4 SUBMITTALS:

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

B. Samples:

1. Shade cloth, each type, 610 mm (24 inch) square, including cord and ring, showing color, finish and texture.

C. Manufacturer's literature and data; showing details of construction and hardware for:

Cloth and window shades

D. Shop Drawings: Provide fabrication and installation details for cloth shades, including shade cloth materials, their orientation to rollers, and their seam and batten locations.

E. Fire Testing: Submit report of flame spread and smoke developed during product material tests by independent testing laboratory.

F. Manufacturer's warranty.

1.5 WARRANTY:

A. Construction Warranty: Comply with FAR clause 52.246-21, "Warranty of Construction".

B. Manufacturer Warranty: Manufacturer shall warranty their window shades for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer's warranty.

1.6 APPLICABLE PUBLICATIONS:

A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced to in the text by the basic designation only.

B. Federal Specifications (Fed. Spec.):

AA-V-00200B.....Venetian Blinds, Shade, Roller, Window, Roller, Slat, Cord, and Accessories

C. ASTM International (ASTM):

A240/A240M-23.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

B221-21.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

B221M-21.....Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes (Metric)

G21-15(R2021)e1.....Determining Resistance of Synthetic Polymeric Materials to Fungi

D. National Electric Manufacturer's Association (NEMA):

ICS 6-93(R2016).....Industrial Control and Systems Closures

E. National Fire Protection Association (NFPA):

70-23.....National Electrical Code (NEC)

701-23.....Fire Tests for Flame Propagation of Textiles and Films

F. Underwriters Laboratories Inc. (UL):

325-17(R2023).....Door, Drapery, Gate, Louver, and Window Operators and Systems

PART 2 - PRODUCTS

2.1 CLOTH SHADES:

A. Light-Filtering Shade Cloth: Woven fabric, stain and fade resistant.

1. Type: as shown on drawings, following facility standards.
2. Weave: Basketweave.
3. Thickness: 0.036in.
4. Weight: 21 ounces per square yard).
5. Orientation on Shadeband: Up the bolt.
6. Openness Factor: 1 percent.
7. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Submit report for testing of shade cloth materials identical to products provided.
8. Drive-End Location: Right side of inside face of shade.
9. Shade Cloth Anti-Microbial Characteristics: 'No Growth' per ASTM G21 results for fungi ATCC9642, ATCC9677, and ATCC9645.

2.2 VENETIAN BLINDS:

2.3 VERTICAL BLIND LOUVER BLADES:

2.4 VENETIAN BLINDS AND SHADES ENCLOSED IN WINDOWS:

2.5 MATERIALS:

A. Stainless Steel: ASTM A240/A240M.

B. Extruded Aluminum: ASTM B221M (B221).

C. Cords for Cloth roller shades#10 stainless steel chain having not less than 80 kg (175 pounds) breaking strength.

2.6 FASTENINGS:

A. Zinc-coated or cadmium plated steel or stainless steel fastenings of length and type recommended by manufacturer. Except as otherwise specified, provide fastenings for installation with various structural materials as follows:

Type of Fastening	Structural Material
Wood screw	Wood
Tap screw	Metal
Case-hardened, self-tapping screw in pre-drilled hole	Solid masonry, concrete
Screw or bolt in expansion shields	Solid masonry, concrete
Toggle bolts	Hollow blocks, gypsum wallboard, plaster

2.7 FABRICATION:

A. Fabricate cloth shades to fit measurements of finished openings obtained at site.

B. Cloth Shades: Rolling type, constructed of shade cloth mounted on rollers. Provide shade cloth with plain sides, and with hem at bottom to accommodate weight bar.

1. Provide separate shades for each individual sash within opening. Provide shade length that exceeds height of window by 305 mm (12 inches) measured from head to sill, in addition to material required to make-up hem:

a. Provide rollers with spindles, nylon bearings, tempered steel springs, and other related accessories required for positive action.

b. Provide rollers of diameter and wall thicknesses required to accommodate operating mechanisms, weights, and widths of shadebands indicated without deflection.

c. Provide rollers with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

d. Secure shade cloth to rollers to prevent wrinkling or folding, and on line parallel to axis of rollers so that shade hangs plumb.

e. Secure shade cloth with zinc-coated steel or stainless steel machine screws spaced not over 228 mm (9 inches) on centers.

f. Do not attach shade cloth to rollers with tacks.

g. Provide hem bar of extruded aluminum for entire width of shade band. Heat seal hem bar on all sides to prevent removal.

h. Provide eyelets with clear openings large enough to accommodate cords, without cutting into cloth when set.

i. Provide cords of sufficient length to permit shades to be drawn to bottom of opening with ends looped and held with cord rings. Attach cords to hems through metal eyelets in center of slats in bottom hems.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Measure openings before fabrication. Do not scale construction documents.

B. Cloth Shades: Mount window shades on end of face brackets, set on metal gussets, or casing of windows as required. Provide extension face brackets where necessary at mullions. In existing buildings, provide brackets similar to those on existing windows.

1. Locate rollers in level position as high as practicable at heads of windows.
2. Install shades to prevent infiltration of light over rollers.
3. Where extension brackets are necessary for alignment of shades, provide metal lugs, and rigidly anchor lugs and brackets.
4. Place brackets and rollers so that shades do not interfere with window and screen hardware.
9. Shade installation methods not specifically described, are subject to approval of Contracting Officer Representative (COR).

3.2 ADJUSTING:

A. Adjust and shades to operate smoothly, free from binding or malfunction throughout entire operational range.

3.3 CLEANING AND PROTECTION:

A. Clean shade surfaces after installation, according to manufacturer’s written instructions.

B. Provide final protection and maintain conditions that ensure that shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged shades that cannot be repaired, in a manner approved by COR before time of Substantial Completion.

3.4 DEMONSTRATION:

- - - E N D - - -

01-01-21

SECTION 12 32 00
MANUFACTURED WOOD CASEWORK

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies plastic laminate casework as detailed on the construction documents, including related components and accessories required to form integral units. Wood casework items shown on the construction documents, but not specified below are to be included as part of the work under this section, and applicable portions of the specification are to apply to these items.

1.2 RELATED WORK

A. Section 06 20 00, FINISH CARPENTRY: Custom Wood Casework.
B. Section 07 92 00, JOINT SEALANTS: Sealants.
C. Section 09 06 00, SCHEDULE OF FINISHES: Color of Casework Finish.
D. Section 09 22 16, NON-STRUCTURAL METAL FRAMING: Backing Plates for Wall Mounted Casework.
E. Section 09 65 13, RESILIENT BASE AND ACCESSORIES: Resilient Base.
F. Section 12 36 00, COUNTERTOPS: Countertop Construction and Materials and Items Installed in Countertops.
G. Division 22, PLUMBING: Plumbing Requirements Related to Casework.
H. Division 26, ELECTRICAL: Electrical Lighting and Power Requirements Related to Casework.

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
B. Manufacturer's Literature and Data:
   1. Locks for doors and drawers.
   2. Adhesive cements.
   3. Casework hardware.
C. Samples:
   1. Wood Face Veneer or Hardwood Plywood.
   2. Plastic laminate.
D. Shop Drawings (1/2 full size):
   1. Each casework type, showing details of construction, including materials, hardware and accessories.

2. Fastenings and method of installation.

E. Certification:

1. Manufacturer’s qualifications specified.
2. Installer’s qualifications specified.

1.4 QUALITY ASSURANCE

A. Approval by COR is required of manufacturer and installer based upon certification of qualifications specified.

B. Manufacturer’s qualifications:

1. Manufacturer is regularly engaged in design and manufacture of modular plastic laminate casework, casework components and accessories of scope and type similar to indicated requirements for a period of not less than five (5) years.
2. Manufacturer has successfully completed at least three (3) projects of scope and type similar to indicated requirements.
3. Submit manufacturer’s qualifications and list of projects, including owner contact information.

C. Installer Qualifications:

1. Installer has completed at least three (3) projects in last five (5) years in which these products were installed.
2. Submit installer qualifications.

1.5 WARRANTY

A. Construction Warranty: Comply with FAR clause 52.246-21 “Warranty of Construction”.

B. Manufacturer Warranty: Manufacturer shall warranty their wood casework for a minimum of five (5) years from date of installation and final acceptance by the Government. Submit manufacturer warranty.

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 basic designation only.

B. ASTM International (ASTM):

A240/A240M-23.....Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

A1008/A1008M-23e1.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy

C1036-21.....Flat Glass

C. Builders Hardware Manufacturers Association (BHMA):

A156.1-21.....Butts and Hinges

A156.5-20.....Auxiliary Locks and Associated Products

A156.9-20.....Cabinet Hardware

A156.11-19.....Cabinet Locks

A156.16-23.....Auxiliary Hardware

D. Composite Panel Association (CPA):

A208.1-22.....Particleboard

A208.2-22.....Medium Density Fiberboard (MDF) for Interior Applications

E. U.S. Department of Commerce Product Standards (Prod. Std):

PS 1-22.....Construction and Industrial Plywood

F. Hardwood, Plywood and Veneer Association (HPVA):

HP-1-20.....Hardwood and Decorative Plywood

G. Architectural Woodwork Institute (AWI):

Architectural Woodwork Standards, Edition 2 Certification Program - 2014

H. American Society of Mechanical Engineers (ASME):

A112.18.1-18(R2023).....Plumbing Fixture Fittings

I. National Electrical Manufacturers Association (NEMA):

LD 3-05.....High Pressure Decorative Laminates

J. Scientific Equipment and Furniture Association (SEFA):

2.3-10.....Installation of Scientific Laboratory Furniture and Equipment

K. Underwriters Laboratories Inc. (UL):

437-13.....Key Locks

PART 2 - PRODUCTS

2.1 PLYWOOD, HARDWOOD FACE VENEER

2.2 PLASTIC LAMINATE

A. NEMA LD 3.

B. Exposed decorative surfaces, both sides of cabinet doors, and for items having plastic laminate finish. General purpose Type HGL.

C. Cabinet Interiors Including Shelving: Both of following options to comply with NEMA LD 3 as a minimum.

1. Plastic laminate clad plywood or particleboard, MDF (excluding shelves).

D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.

E. Post Forming Fabrication, Decorative Surface: Post forming Type HGP.

2.3 PLYWOOD, SOFTWOOD

2.4 MEDIUM DENSITY FIBERBOARD (MDF)

A. Fully waterproof bond conforming to CPA A208.1 and CPA A208.2.

2.5 GLASS

A. ASTM C1048 Kind FT Type I, Class 1, Quality q3.

B. For Doors: 6 mm (1/4 inch) thick; except where laminated glass is shown on construction documents.

2.6 HARDWARE

A. Cabinet Locks:

1. Provide where locks are indicated on construction documents.
2. Locked pair of hinged doors over 915 mm (36 inches) high:
   a. ANSI/BHMA A156.5, key one side.
   b. On active leaf use three (3) point locking device, consisting of two (2) steel rods and lever controlled cam at lock, to operate by lever having lock cylinder housed therein.
   c. On inactive leaf provide dummy lever of same design.
   d. Provide keeper holes for locking device rods and cam.
3. Door and Drawer: ANSI/BHMA A156.11 cam locks. Provide one (1) type for each condition as follows:
   a. Drawer and Hinged Door up to 915 mm (36 inches) high: E07261.
   b. Drawer and Hinged Door: Pin-tumbler, cylinder type lock with not less than four (4) pins or a UL 437 rated wafer lock with brass working parts and case.
   c. Sliding Door: E07161.
4. Key locks differently for each type casework and master key for each service, such as Administrative.
   a. Key drug locker inner door different from outer door.
   b. Furnish two (2) keys per lock.
   c. Furnish six (6) master keys per service or Nursing Unit.
5. Marking of Locks and Keys:

a. Name of manufacturer, or trademark which can readily be identified legibly marked on each lock and key change number marked on exposed face of lock.
b. Key change numbers stamped on keys.
c. Key change numbers to provide sufficient information for manufacturer to replace key.

B. Hinged Doors:
1. Provide doors 915 mm (36 inches) and more in height with three (3) hinges and doors less than 915 mm (36 inches) in height is to have two (2) hinges. Each door is to close against two (2) rubber bumpers.
2. Hinges: Fabricate hinges with minimum 1.8 mm (0.072 inch) thick chromium plated steel leaves, and with minimum 3.5 mm (0.139 inch) diameter stainless steel pin. Hinges to be five (5) knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.
3. 4. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.

C. Door Catches:
1. Friction or Magnetic type fabricated with metal housing.
2. Provide one (1) catch for cabinet doors 1220 mm (48 inches) high and under, and two (2) for doors over 1220 mm (48 inches) high.

D. Drawer and Door Pulls:
1. Doors and drawers to have flush pulls, fabricated of either chromium-plated brass, chromium plated steel, stainless steel, or anodized aluminum. Drawer and door pulls to be of a design that can be operated with a force of 22.2 N (5 pounds) or less, with one (1) hand and not require tight grasping, pinching or twisting of the wrist.

E. Drawer Slides:
1. Full extension steel slides with nylon ball-bearing rollers.
2. Slides to have positive stop.
3. Equip drawers with rubber bumpers.

F. Sliding Doors:
1. Each door to be supported by two ball bearing bronze or nylon rollers, or sheaves riding on a stainless steel track at top or

bottom, and to be restrained by a nylon or stainless steel guide at the opposite end.

2. Plastic guides are not acceptable.
3. Each door to have rubber silencers set near top and bottom of each jamb.

G. Shelf Standards (Except For Fixed Shelves):

1. Bright zinc-plated steel for recessed mounting with screws, 16 mm (5/8 inch) wide by 5 mm (3/16 inch) high providing 13 mm (1/2 inch) adjustment, complete with shelf supports.

H. Gate Bolt:

1. Surface mounted barrel type with strike.

2.7 MANUFACTURED PRODUCTS

A. When two (2) or more units are required, use products of one (1) manufacturer.

B. Manufacturer of casework assemblies is to assume complete responsibility for the final assembled unit.

C. Provide products of a single manufacturer for parts which are alike.

2.8 FABRICATION

A. Casework to be of the flush overlay design and, except as otherwise specified, be of Premium Grade construction and of component thickness in conformance with AWI Quality Standards.

B. Fabricate casework of plastic laminated covered plywood or particleboard as follows:

1. Where shown, doors drawers shelves all semi-concealed surfaces to be plastic laminated.
2. Horizontal and vertical reveals between doors and drawer for reveal overlay design to be 19 mm (3/4 inch) unless otherwise shown.

C. Provide 1.2 mm (18 gage) sheet steel sloping tops for casework where shown on construction drawings. Fasten sloping tops with oval-head screws inserted from interior. Exposed ends of sloping tops to have flush closures fastened as recommended by manufacturer.

D. Support Members for Tops of Tables and Countertops:

1. Construct as detailed on construction documents.
2. Provide miscellaneous steel members and anchor as shown on construction drawings.

E. Legs for Counters:

1. Fabricate legs for counters of 1.6 mm (0.0635 inch) thick, 38 mm (1-1/2 inch) square tubular stainless steel.
2. Secure legs to counter tops and provide legs at bottom with shoes not less than 25 mm (1 inch) in height.
3. Fabricate shoes of stainless steel, aluminum or chromium plated brass.

2.9 PRODUCTS OF OTHER COMPONENTS DIRECTLY RELATED TO CASEWORK

A. Refer to Section 07 92 00, JOINT SEALANTS for work related to sealants used in conjunction with joints of countertops, casework systems, and adjacent materials.

B. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES for work related to rubber base adhered to casework systems.

C. Refer to Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates used in conjunction with wall assemblies for the attachment of casework systems.

D. Refer to Section 12 36 11, COUNTERTOPS for work related to plastic laminate, acid-resistant plastic laminate, metal, molded resin, wood, and methyl methacrylic polymer countertops and/or shelving used in conjunction with casework systems. When countertop materials are provided by the casework manufacturer, they are to include the following features:

1. Capable of being suspended from vertical support rails or horizontal wall strips or service modules.
2. Provided with rounded corners and impact resistant material on exposed edges.
3. Capable of being easily relocated and installed without tools.
4. Capable of being suspended and easily changed under counter mounted storage units.
5. Provide leveling adjustment capability so units can be brought into a level position.
6. Secured using fasteners. Show detail on shop drawings.

E. Refer to Section 12 36 11, COUNTERTOPS for work related to and integral with countertop systems such as pegboards, funnel and graduate racks.

F. Refer to Division 22, PLUMBING for the following work related to casework systems:

1. Sinks, faucets and other plumbing service fixtures, venting, and piping systems.
2. Compressed air, gas, vacuum and piping systems.

G. Refer to Division 26, ELECTRICAL for the following work related to casework systems:
1. Connections and wiring devices.
2. Connections and lighting fixtures except when factory installed by the manufacturer.

PART 3 - EXECUTION

3.1 COORDINATION

A. Begin only after work of other trades is complete, including wall and floor finish completed, ceilings installed, light fixtures and diffusers installed and connected and area free of trash and debris.

B. Verify location and size of mechanical and electrical services as required and perform cutting of components of work installed by other trades.

C. Verify reinforcement of walls and partitions for support and anchorage of casework.

D. Coordinate with other Divisions and Sections of the specification for work related to installation of casework systems to avoid interference and completion of service connections.

3.2 INSTALLATION

A. Install casework in accordance with manufacturer’s written instructions and per SEFA 2.3 recommendations.
1. Install in available space; arranged for safe and convenient operation and maintenance.
2. Align cabinets for flush joints except where shown otherwise.
3. Install with bottom of wall cabinets in alignment and tops of base cabinets aligned level, plumb, true, and straight to a tolerance of 3.2 mm in 2438 mm (1/8 inch in 96 inches).
4. Install corner cabinets with hinges on corner side with filler or spacers sufficient to allow opening of drawers.

B. Support Rails:
1. Install true to horizontal at heights shown on construction documents; maximum tolerance for uneven floors is plus or minus 13 mm (1/2 inch).

2. Shim as necessary to accommodate variations in wall surface not exceeding 5 mm (3/16 inch) at fastener.

C. Wall Strips:

1. Install true to vertical and spaced as shown on construction documents.
2. Align slots to assure that hanging units will be level.

D. Plug Buttons:

1. Install plug buttons in predrilled or prepunched perforations not used.
2. Use chromium plate plug buttons or buttons finish to match adjacent surfaces.

E. Seal junctures of casework systems with mildew-resistant silicone sealants as specified in Section 07 92 00, JOINT SEALANTS.

3.3 . CLOSURES AND FILLER PLATES

A. Close openings larger than 6 mm (1/4 inch) wide between cabinets and adjacent walls with flat, steel closure strips, scribed to required contours, or machined formed steel fillers with returns, and secured with sheet metal screws to tubular or channel members of units, or bolts where exposed on inside.

B. Where ceilings interfere with installation of sloping tops, omit sloping tops and provide flat steel filler plates.

C. Secure filler plates to casework top members, unless shown otherwise on construction documents.

D. Secure filler plates more than 152 mm (6 inches) in width top edge to a continuous 25 x 25 mm (1 x 1 inch) 0.889 mm (1/16 inch) thick steel formed steel angle with screws.

E. Anchor angle to ceiling with toggle bolts.

F. Install closure strips at exposed ends of pipe space and offset opening into concealed space.

G. Finish closure strips and fillers with same finishes as cabinets.

3.4 FASTENINGS AND ANCHORAGE

A. Do not anchor to wood ground strips.

B. Provide hat shape metal spacers where fasteners span gaps or spaces.

C. Use 6 mm (1/4 inch) diameter toggle or expansion bolts, or other appropriate size and type fastening device for securing casework to

walls or floor. Use expansion bolts shields having holding power beyond tensile and shear strength of bolt and breaking strength of bolt head.

D. Use 6 mm (1/4 inch) diameter hex bolts for securing cabinets together.

E. Use 6 mm (1/4 inch) by minimum 38 mm (1-1/2 inch) length lag bolt anchorage to wood blocking for concealed fasteners.

F. Use not less than No. 12 or 14 wood screws with not less than 38 mm (1-1/2 inch) penetration into wood blocking.

G. Space fastening devices 305 mm (12 inches) on center with minimum of three (3) fasteners in 915 or 1220 mm (3 or 4 foot) unit width.

H. Anchor floor mounted cabinets with a minimum of four (4) bolts through corner gussets. Anchor bolts may be combined with or separate from leveling device.

I. Secure cabinets in alignment with hex bolts or other internal fastener devices removable from interior of cabinets without special tools. Do not use fastener devices which require removal of tops for access.

J. Where units abut end to end, anchor together at top and bottom of sides at front and back. Where units are back to back, anchor backs together at corners with hex bolts placed inconspicuously inside casework.

K. Where type, size, or spacing of fastenings is not shown on construction documents or specified, show on shop drawings proposed fastenings and method of installation.

3.5 ADJUSTMENTS

A. Adjust equipment to insure proper alignment and operation.

B. Replace or repair damaged or improperly operating materials, components or equipment.

3.6 CLEANING

A. Immediately following installation, clean each item, removing finger marks, soil and foreign matter.

B. Remove from job site trash, debris and packing materials.

C. Leave installed areas clean of dust and debris.

3.7 INSTRUCTIONS

A. Provide operational and cleaning manuals and verbal instructions in accordance with Article INSTRUCTIONS, SECTION 01 00 00, GENERAL REQUIREMENTS.

B. Provide in service training both prior to and after facility opening. Coordinate in service activities with COR.

C. Commencing at least seven (7) days prior to opening of facility, provide one (1) four (4) hour day of on-site orientation and technical instruction on use and cleaning procedures application to products and systems specified herein.

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11-01-23

SECTION 12 36 00
COUNTERTOPS

PART 1 - GENERAL

1.1 DESCRIPTION

A. This section specifies casework countertops with integral accessories.

B. Integral accessories include:

1. Sinks with traps and drains.
2. Eye and Face Wash Units.
3. Mechanical Service fixtures.
4. Electrical Receptacles.
5. Hot Plates (Range)
6. Pegboards

1.2 RELATED WORK

A. Color and patterns of plastic laminate: as shown on drawings.

B. DIVISION 22, PLUMBING.

C. DIVISION 26, ELECTRICAL.

D. Equipment Reference Manual for SECTION 12 36 00, COUNTERTOPS.

1.3 SUBMITTALS

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

B. Shop Drawings

1. Show dimensions of section and method of assembly.
2. Show details of construction at a scale of ½ inch to a foot.

C. Samples:

1. 150 mm (6 inch) square samples each top.
2. Front edge, back splash, end splash and core with surface material and booking.

1.4 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 Hardboard Association (AHA):

A135.4-12.....Basic Hardboard

C. Composite Panel Association (CPA):

A208.1-18(2023).....Particleboard

D. American Society of Mechanical Engineers (ASME):

A112.18.1-18.....Plumbing Supply Fittings

A112.1.2-12(2022).....Air Gaps in Plumbing System

A112.19.3-22.....Stainless Steel Plumbing Fixtures (Designed for Residential Use)

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

A167-20.....Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A1008-22.....Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength, Low Alloy

D256-22.....Pendulum Impact Resistance of Plastic

D570-98(R2021).....Water Absorption of Plastics

D638-14 (R2022).....Tensile Properties of Plastics

D785-21.....Rockwell Hardness of Plastics and Electrical Insulating Materials

D790-17(R2021).....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

D4690-12(R2018).....Urea-Formaldehyde Resin Adhesives

F. Federal Specifications (FS):

A-A-1936.....Adhesive, Contact, Neoprene Rubber

G. U.S. Department of Commerce, Product Standards (PS):

PS 1-09(R2020).....Construction and Industrial Plywood

H. National Electrical Manufacturers Association (NEMA):

LD 3-20.....High Pressure Decorative Laminates

PART 2 - PRODUCTS

2.1 MATERIALS

B. Molded Resin:

1. Non-glare epoxy resin or furan resin compounded and cured for minimum physical properties specified:

Property	Result	Test
Flexural strength	70 MPa (10,000 psi)	ASTM D790
Rockwell hardness	105	ASTM D785
Water absorption, 14 hours (weight)	.01%	ASTM D570

2. Material of uniform mixture throughout.

F. Plywood: PS 1, Exterior type, veneer grade AC not less than five ply construction.

I. Adhesive

1. For plastic laminate FS A-A-1936.
2. For wood products: ASTM D4690, unextended urea resin or unextended melamine resin, phenol resin, or resorcinol resin.
3. For Field Joints:
   a. Epoxy type, resistant to chemicals as specified for plastic laminate laboratory surfaces.
   b. Fungi resistant: ASTM G-21, rating of 0.

J. Fasteners:

1. Metals used for welding same metal as materials joined.
2. Use studs, bolts, spaces, threaded rods with nuts or screws suitable for materials being joined with metal splice plates, channels or other supporting shape.

K. Solid Polymer Material:

1. Filled Methyl Methacrylic Polymer.
2. Performance properties required:

Property	Result	Test
Elongation	0.3% min.	ASTM D638
Hardness	90 Rockwell M	ASTM D785
Gloss (60^0 Gordon)	5-20	NEMA LD3.1
Color stability	No change	NEMA LD3 except 200 hour
Abrasion resistance	No loss of pattern Max wear depth 0.0762 mm (0.003 in) - 10000 cycles	NEMA LD3
Water absorption weight (5 max)	24 hours 0.9	ASTM D-570
Izod impact	14 N·m/m (0.25 ft-lb/in)	ASTM D256 (Method A)
Impact resistance	No fracture	NEMA LD-3 900 mm (36") drop 1 kg (2 lb.) ball
Boiling water surface resistance	No visible change	NEMA LD3

Property	Result	Test
High temperature resistance	Slight surface dulling	NEMA LD3

3. Cast into sheet form and bowl form.
4. Color throughout with subtle veining through thickness.
5. Joint adhesive and sealer: Manufacturers silicone adhesive and sealant for joining methyl methacrylic polymer sheet.
6. Bio-based products will be preferred.

2.2 SINKS

B. Stainless Steel:
1. ANSI/ASME A112.19.3, Type 304.
2. Self rim for plastic laminate or similar tops with concealed fasteners.
3. Flat rim for welded into stainless steel tops.
4. Ledge back or ledge sides with holes to receive required fixtures when mounted on countertop.
5. Apply fire resistant sound deadening material to underside.

C. Stainless steel circular or oval shaped bowl.

2.3 TRAPS AND FITTINGS

A. Material as specified in DIVISION 22, PLUMBING.

C. For Stainless Steel Sinks:
1. Either cast or wrought brass or stainless steel P-traps and drain fittings; ASME A112.18.1
2. Flat strainer, except where cup strainer or overflow standpipe specified.
   a. Provide cup strainer in cabinet type 1B.
   b. Provide stainless steel overflow stand pipe to within 38 mm (1-1/2 inches) of sink rim.
3. Exposed surface chromium plated finish.

E. Air Gap Fittings: ASME A112.1.2.

2.4 WATER FAUCETS

A. ASME A112.18.1.
1. Cast or forged brass, compression type with replaceable seat and stem assembly or replaceable cartridge.
2. Indexed lever handles either with or without head.

3. Gooseneck minimum clearance above countertop of 190 mm (7-1/2 inches), bent 180 degrees for vertical discharge.
4. Swing spouts elevated to clear handles.
5. Exposed brass surfaces chromium plated.
6. Cast combination hot and cold fixture with one piece body for multiple outlets.
7. Adapter type connection which will permit field conversion of swing spouts to fixed or gooseneck grouts or vice versa.
8. Pedestals Top for Laboratory or Pharmacy:
   a. Modern design tapered to a round base, factory assembled and tested.
   b. Brass shanks, locknuts and washers for attaching to top or curbs.

B. Laminar flow control device on spouts.

C. Automatic Controlled Faucets.
1. Infra-red photocell sensor and a solenoid valve to control water flow automatically.
2. Breaking light beam activates water flow.
3. Water stops when user moves away from light beam.

E. Eye and Face Wash Unit Pull-Out-Type:
1. Deck mounted.
2. Designed for vandal resistant push-down control valve and 6 foot hose.
3. Eye and face wash head, provide a soft stream for flushing action.
4. Valve, when opened; remain open until manually closed.

F. Eye and Face Bath, Counter Mounted:
1. Stainless Steel circular or oval shaped self rimmed sink, as shown on drawings.
2. Two fully enclosed rubber bound spray heads to provide an aerated flow of water simultaneously into both eyes and across face.
3. Push-pull hand operated valve.
4. Volume regulator for each spray.

2.5 FUEL GAS, LABORATORY AIR AND LABORATORY VACUUM FIXTURES

2.6 FIXTURE IDENTIFICATION

A. Code fixtures with full view plastic index buttons.

B. Use following colors and codes:

SERVICE	COLOR	CODE	COLOR OF LETTERS
Cold Water	Dark Green	CW	White
Hot Water	Red	HW	White
Laboratory Air	Orange	AIR	Black
Fuel Gas	Dark Blue	GAS	White
Laboratory Vacuum	Yellow	VAC	Black
Distilled Water	White	DW	Black
Deionized Water	White	DI	Black
Oxygen	Light Green	OXY	White
Hydrogen	Pink	H	Black
Nitrogen	Gray	N	Black
All Other Gases	Light Blue	CHEM.SYM.	Black

2.7 ELECTRICAL RECEPTACLES

A. Hospital grade per electrical specifications.

B. Curb Mounted Receptacles:

1. NEMA 5-20R duplex in galvanized steel box.
2. Chromium plated brass or steel face plate.

C. Pedestal Mounted Receptacles:

1. NEMA 5-20R duplex installed in double faces.
2. Polished stainless steel or aluminum, or chromium plated brass pedestal.

2.8 ELECTRIC DROP-IN HOTPLATE (RANGE) UNITS

A. Built-in type units in stainless steel exposed surfaces.

B. Service ____ volts, ____ phase.

C. Smooth flat cooking surfaces.

D. Metal sheath type heating units having removable heating elements and drip pans, protected terminals or lead wires with protected splices for connections and means for positive grounding.

1. No open seams or holes in metal sheath and made of material that will not scale or crack at temperatures reached in service.
2. Resistance wire: Uniformly spaced coil of nickel chromium alloy wire insulated from sheath by dense compaction of insulating material.
3. Terminals or lead wires suitable for rating of units.

E. Heating Units:
   1. Double units rated not less than 2600 watts per unit.
   2. Not more than 200 mm (8 inches) in diameter.
   3. Capable of bringing four quarts of cold water to boil in six minutes.

F. Separate Control Unit:
   1. Suitably attached and prewired to range unit.
   2. Separate switch for each heating unit.
      a. Commercial quality, rotatable in either direction through 360 degrees.
      b. At least three heat levels.
   3. Operating dials for switches clearly marked to indicate control positions and easily visible in ordinary light.
   4. Control unit front removable.

G. Indicating light assembly
   1. Mounted on the Control Unit Front.
   2. Red lens and high brightness neon glow type lamp with resistor suitably for 25,000 hours average life.

H. Fuses and Circuit Breakers:
   1. Easily accessible from front of cabinet.
   2. Do not locate at back of storage or where articles can be stored in the front.

I. Range and Control Units Concealed Surfaces:
   1. Made of materials suitable for the intended use.
   2. Low carbon steel galvanized or other suitable corrosion resistant finish.
   3. Provide a solid 1.5 mm (0.0598 inch) thick sheet steel barrier below the unit, located a minimum of nine inches below the unit top.

2.9 FILM VIEWER

A. Designed for flush mounting in countertop.

B. Translucent or opalescent panel 400 mm by 500 mm (16 inch by 20 inch).

C. Minimum of three 15 watt or two 20 watt fluorescent tubes in UL listed enclosure.

D. Provide "on-off" switch for fluorescent tube for front panel of cabinet.

2.10 COUNTERTOPS

A. Fabricate in largest sections practicable.

B. Fabricate with joints flush on top surface.

C. Fabricate countertops to overhang front of cabinets and end of assemblies 25 mm (one inch) except where against walls or cabinets.

D. Provide 1 mm (0.039 inch) thick metal plate connectors or fastening devices (except epoxy resin tops).

E. Join edges in a chemical resistant waterproof cement or epoxy cement, except weld metal tops.

F. Fabricate with end splashes where against walls or cabinets.

G. Splash Backs and End Splashes:

1. Not less than 19 mm (3/4 inch) thick.
2. Height 100 mm (4 inches) unless noted otherwise.
3. Laboratories and pharmacy heights or where fixtures or outlets occur: Not less than 150 mm (6 inches) unless noted otherwise.
4. Fabricate epoxy splash back in maximum lengths practical of the same material.

H. Drill or cutout for sinks, and penetrations.

1. Accurately cut for size of penetration.
2. Cutout for VL 81 photographic enlarger cabinet.
   a. Finish cutout to fit flush with vertical side of cabinet, allowing adjustable shelf to fit into cutout space of cabinet at counter top level. Finish cutout surface as an exposed edge.
   b. Provide braces under enlarger space to support not less than 45 kg (100 pounds) centered on opening side along backsplash.

K. Molded Resin Tops:

1. Molded resin with drip groove cut on underside of overhanging edge.
2. Finish thickness of top minimum 25 mm (1 inch).
3. Joints: Epoxy Type.
4. Secure reagent shelves to counter tops with fasteners from underside and seal seam.

L. Maple tops:

1. Fabricate in one piece of solid laminated tongue and groove maple strips, not more than three inches in width, glued under pressure to a thickness 45 mm (1-3/4 inches).

2. Edges and ends of clear maple wood. Make splash backs and splash ends of 19 mm (3/4 inch) thick maple and secure to counter tops with concealed metal fasteners and with contact surfaces set in waterproof glue.
3. Round exposed edges of maple tops and backs to approximate 9 mm (3/8 inch) radius.
4. Sand exposed surfaces smooth and even and apply two coats of boiled linseed oil. Rub in each coat and allow 48 hours to lapse between coats.

S. Countertop products shall comply with following standards for biobased materials:

Material Type	Percent by Weight
Composite Panel	89 percent biobased material
Hardwood	89 percent biobased material
Particleboard	89 percent biobased material
Plywood	89 percent biobased material

The minimum-content standards are based on the weight (not the volume) of the material in the insulating core only.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Before installing countertops verify that wall surfaces have been finished as specified and that mechanical and electrical service locations are as required.

B. Secure countertops to supporting rails of cabinets with metal fastening devices, or screws through pierced slots in rails.
1. Where type, size or spacing of fastenings is not shown or specified, submit shop drawings showing proposed fastenings and method of installation.
2. Use round head bolts or screws.
3. Use epoxy or silicone to fasten the epoxy resin countertops to the cabinets.
4. Use wood or sheet metal screws for wood or plastic laminate tops; minimum penetration into top 16 mm (5/8 inch), screw size No 8, or 10.

C. Rubber Moldings:
   1. Where shown install molding with butt joints in horizontal runs and mitered joints at corners where ceramic tile occurs omit molding.
   2. Fasten molding to wall and to splashbacks and splashends with adhesive.

D. Sinks
   1. Install stainless steel sink in plastic laminate tops with epoxy compound to form watertight seal under shelf rim.
      a. In laboratory and pharmacy fit stainless steel sink with overflow standpipe.
      b. Install faucets and fittings on sink ledges with watertight seals where shown.
   2. Install molded resin sinks with epoxy compound to form watertight seal with underside of molded resin top.
      a. Install sink with not less than two channel supports with threaded rods and nuts at each end, expansion bolted to molded resin top.
      b. Design support for a twice the full sink weight.
      c. Install with overflow standpipes.

E. Faucets, Fixtures, and Outlets:
   1. Seal opening between fixture and top.
   2. Secure to top with manufacturers standard fittings.

3.2 PROTECTION AND CLEANING

A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.

B. Clean at completion of work.

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DIVISION 13
SPECIAL CONSTRUCTION

SECTION 13 05 41
SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Provide seismic restraint in accordance with the requirements of the drawings, VA Handbook H18-8: Seismic Design Requirements and this specification in order to maintain the integrity of non-structural components and equipment of the building so that they remain safe and functional in case of seismic event.

B. The design of seismic restraints of non-structural components to resist seismic load shall be based on Seismic Design parameters indicated below in accordance with VA H-18-8 in conjunction with ASCE 7, as specified in H-18-8 Section 4.0, for existing building retrofit projects. Specific requirements for Critical and Essential facilities are covered in Section 4.0 of H-18-8, including applying Ip = 1.5 for all nonstructural components in Critical facilities.

1. International Building Code 2021 Edition
2. American Society of Civil Engineers Seismic Evaluation and Retrofit of Existing Buildings ASCE 41-17.
3. American Society of Civil Engineers Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7)7-22
4. Facility Occupancy Category per VA H-18-8: Critical
5. Site Class: D
6. Building Risk Category: IV
7. Mapped MCE_R 0.2 s period Spectral Response Acceleration Parameter (Ss): 0.33g
8. Mapped MCE_R 1.0 s period Spectral Response Acceleration Parameter (S1): 0.120g
9. Short period Spectral Response Acceleration Parameter (Sds): 0.26g
10. Short period Spectral Response Acceleration Parameter (Sd1): 0.16g
11. Building Seismic Design Category: D
12. Component Importance Factor (Ip): 1.5
13. Components Response Modification Factor (Rp): 1.5 for Architectural Components; 1.5 for all mechanical and electrical components except as follows:

a. Air-side HVACR, fans, air handlers, air distribution boxes, and other mechanical components constructed of sheet metal framing: 2

b. Motor control centers, panel boards, switch gear, instrumentation cabinets, and other components constructed of sheet metal framing: 2

c. Vibration-Isolated components and systems: 1.3

14. Components Overstrength Factor: 2

C. Definitions: Non-structural building components are components or systems that are not part of the building's structural system whether inside or outside, above or below grade. Non-structural components of buildings include but are not limited to (Refer to VA H-18-8, ASCE 7 and ASCE 41 for additional examples):

1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; cornices and other architectural projections and parapets that do not function structurally; glazing; nonbearing partitions; suspended ceilings; stairs isolated from the basic structure; cabinets; bookshelves; medical equipment; and storage racks, etc.
2. Electrical Elements: Power and lighting systems; substations; switchgear and switchboards; auxiliary engine-generator sets; transfer switches; motor control centers; motor generators; selector and controller panels; fire protection and alarm systems; special life support systems; and telephone and communication systems, etc.
3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; medical gas systems; plumbing systems; sprinkler systems; pneumatic systems; boiler/chiller/utility plant/other equipment and components, etc.
4. Transportation Elements: Mechanical, electrical and structural elements for transport systems, i.e., elevators and dumbwaiters, including hoisting equipment and counterweights.

1.2 RELATED WORK:

Related specifications include but are not limited to those shown below. Coordinate all work with the applicable specification for that work.

A. Cast-In-Place Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE

B. Structural Steel Framing: Section 05 12 00, STRUCTURAL STEEL FRAMING

C. Metal Fabrication: Section 05 50 00, METAL FABRICATIONS

D. Acoustical Ceilings: Section 09 51 00 ACOUSTICAL CEILINGS

E. Interior Lighting: Section 26 51 00, INTERIOR LIGHTING

1.3 QUALITY CONTROL:

A. Shop-Drawing Preparation:

1. Non-structural seismic restraint systems shop drawings and delegated design calculations shall be prepared by a professional structural engineer with a minimum of 5 years' experience in the design and detailing of seismic force restraints. The professional structural engineer shall be registered in the state where the project is located and submit qualifications with list of projects illustrating compliance with the experience requirement of this section.
2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State where project is located.

B. Coordination:

1. Do not install seismic restraints until seismic restraint submittals are approved by the Contracting Officers Representative (COR).
2. Coordinate trapezes or other multi-pipe hanger systems prior to submission of shop drawings for review.

C. Seismic Certification:

In structures assigned to Seismic Design Category C, D, E, or F, permanent equipment and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7, including those required in existing buildings within Section 13.7.1.3.3, 13.7.7.3.3 and 13.7.8.3.3 of ASCE 41, except for equipment and components that are considered inherently rugged as listed in Section 4.2.2 of VA H18-8, and shall comply with section 13.2.6 of ASCE 7.

1.4 SUBMITTALS:

A. Submit a complete and coordinated set of bracing and signed and sealed anchorage drawings and calculations for all non-structural elements requiring seismic restraint by the delegated professional structural engineer mentioned in Section 1.3.A.1 for review prior to installation including:

1. Description, layout, and location of all items to be anchored or braced with anchorage or brace points noted and dimensioned.

2. Details of all anchorage and bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified. Details shall be coordinated with all project conditions and trades prior to shop drawing submission for review.
3. Complete calculations including but not limited to seismic design criteria, computer model input and output, seismic design forces and capacities, design tables and information used for all proprietary design elements such as post installed anchors, stamped and signed by a professional structural engineer specified in section 1.3 A.1.
4. For all post installed anchorages submit the appropriate International Code Council Engineering Service (ICC-ES) evaluation reports, California's Office of Statewide Health Planning and Development(OSHPD) pre-approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.
5. Delegated professional structural engineer qualifications.

B. Submit for review prior to installation, the following for seismic protection of piping in addition to items noted in Section 1.4.A:
1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.
2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
3. Pipe contents.
4. Structural framing for the seismic and gravity support and the main superstructure for which the bracing and or anchorage is attached.
5. Location of all gravity load pipe supports and spacing requirements.
6. Numerical value of gravity load reactions.
7. Location of all seismic bracing.
8. Numerical value of applied seismic brace loads.
9. Type of connection (Vertical support, vertical support with seismic brace etc.).
10. Seismic brace reaction type (tension or compression): Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.

C. Submit for review prior to installation, the following items for seismic protection of suspended ductwork and suspended electrical and communication cables, in addition to items noted in Section 1.4.A:
   1. Details illustrating all support and bracing components, methods of connection, and specific anchors to be used.
   2. Numerical value of applied gravity and seismic loads and seismic loads acting on support and bracing components.
   3. Maximum spacing of hangers and bracing.

1.5 APPLICABLE PUBLICATIONS:

A. The Publications listed below (including amendments, addenda revisions, supplements and errata) form a part of this specification to the extent referenced. The publications are referenced in text by basic designation only.

B. American Concrete Institute (ACI):
   355.2-19.....Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary

C. American Institute of Steel Construction (AISC):
   Load and Resistance Factor Design, Volume 1, Second Edition

D. ASTM International (ASTM):
   A36/A36M-21.....Standard Specification for Carbon Structural Steel
   A53/A53M-24.....Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   A307-24.....Standard Specifications for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength
   A325-24.....Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
   A325M-24.....Standard Specification for High-Strength Bolts for Structural Steel Joints [Metric]
   A490.....Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength

A490M.....Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]

A500/A500M-23.....Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

A501/A501M-21.....Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing

A615/A615M-24.....Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement

A992/A992M-22.....Standard Specification for Steel for Structural Shapes for Use in Building Framing

A996/A996M-24.....Standard Specification for Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement

E488/E488M-22.....Standard Test Methods for Strength of Anchors in Concrete Elements

E. American Society of Civil Engineers

1. Minimum Design Loads and Associated Criteria for Buildings and Other Structures (ASCE 7) Edition as indicated in section 1.1 B of this specification. Associated Criteria for Buildings and Other Structures (ASCE 7): 7-22

F. International Building Code (IBC) Edition as indicated in Section 1.1 B of this specification.

G. VA Handbook H18-8 Seismic Design Requirements, VA H-18-8, November 2019(REVISED MAY 1,2020)

H. National Uniform Seismic Installation Guidelines (NUSIG)

I. Sheet Metal and Air Conditioning Contractors National Association

J. (SMACNA): Seismic Restraint Manual - Guidelines for Mechanical Systems, 3RD EDITION 2008 and Addendum

1.6 REGULATORY REQUIREMENT:

A. IBC as shown in Section 1.1 B of this specification.

B. Exceptions: The omission of seismic restraints shall be allowed only in accordance with VA H18-8, ASCE 7 and ASCE 41.

PART 2 - PRODUCTS

2.1 STEEL:

A. Structural Steel: ASTM A36,A992.

B. Structural Tubing: ASTM A500, Grade B.

C. Structural Tubing: ASTM A501.

D. Steel Pipe: ASTM A53/A53M, Grade B.

E. Bolts & Nuts: ASTM A307,A325.

2.2 CAST-IN-PLACE CONCRETE:

A. Concrete: 28 day strength, f'c = (3,000 psi) (4,000 psi)

B. Reinforcing Steel: ASTM A615/615M or ASTM A996/A996M deformed.

PART 3 - EXECUTION

3.1 CONSTRUCTION, GENERAL:

A. Provide equipment supports and anchoring devices to withstand the seismic design forces, so that when seismic design forces are applied, the equipment cannot displace, overturn, or become inoperable.

B. Provide anchorages in conformance with recommendations of the equipment manufacturer and as shown on approved shop drawings and calculations.

C. Construct seismic restraints and anchorage to allow for thermal expansion.

D. Testing Before Final Inspection:

1. Test 10-percent of anchors in masonry and concrete per ASTM E488, and ACI 355.2 to determine that they meet the required load capacity. If any anchor fails to meet the required load, test the next 20 consecutive anchors, which are required to have zero failure, before resuming the 10-percent testing frequency.
2. Before scheduling Final Inspection, submit a report on this testing indicating the number and location of testing, and what anchor-loads were obtained.
3. Construct seismic restraints and anchorages to not interfere with other trades or damage existing or in-situ elements of the constructed building.

3.2 EQUIPMENT RESTRAINT AND BRACING:

A. See drawings for equipment to be restrained or braced.

3.3 MECHANICAL DUCTWORK AND PIPING; BOILER PLANT STACKS AND BREACHING; ELECTRICAL BUSWAYS, CONDUITS, AND CABLE TRAYS; AND TELECOMMUNICATION WIRES AND CABLE TRAYS

A. Support and brace mechanical ductwork and piping; electrical busways, conduits and cable trays; and telecommunication wires and cable trays

including boiler plant stacks and breeching to resist directional forces (lateral, longitudinal and vertical).

B. Brace duct and breeching branches with a minimum of 1 brace per branch.

C. Provide supports and anchoring so that, upon application of seismic forces, piping remains fully connected as operable systems which will not displace sufficiently to damage adjacent or connecting equipment, or building members.

D. Piping Connections: Provide flexible connections where pipes connect to equipment. Make the connections capable of accommodating relative differential movements between the pipe and equipment under conditions of earthquake shaking.

3.4 PARTITIONS

A. In buildings with flexible structural frames, anchor partitions to only structural element, such as a floor slab, and separate such partition by a physical gap from all other structural elements.

B. Properly anchor masonry walls to the structure for restraint, so as to carry lateral loads imposed due to earthquake along with their own weight and other lateral forces.

3.5 CEILINGS AND LIGHTING FIXTURES

A. At intervals required to meet the seismic demand forces, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls.

B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.

3.6 FACADES AND GLAZING

DESIGNER NOTES:

A. Do not install concrete masonry unit filler walls in a manner that can restrain the lateral deflection of the building frame. Provide a gap with adequately sized resilient filler to separate the structural frame from the non-structural filler wall.

B. Tie brick veneers to a separate wall that is independent of the steel frame as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

C. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.7 STORAGE RACKS, CABINETS, AND BOOKCASES

A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.

B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.

C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.

D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

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