

PROJECT MANUAL

**OUTPATIENT
PHARMACY DESIGN
Vol. 1 (1 of 2)**

**100% CONSTRUCTION DOCUMENTS
ISSUED FOR BIDDING**

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PREPARED FOR:

**SAN FRANCISCO
VA MEDICAL CENTER**
4150 Clement Street
San Francisco, CA 94121

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GENERAL REQUIREMENTS**

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**SECTION 01 00 00
GENERAL REQUIREMENTS**

1.1 GENERAL INTENTION

A. Contractor shall completely prepare site for construction operations, and furnish all labor, equipment and materials and perform work for the project, as required by the drawings and specifications.

Scope Includes, but is not limited to, the following:

1. Demolition of existing interior portions of Building 200 and Building 2 and AHU in Building 200 basement
2. New AHU in Building 200 basement.
3. New exhaust fan on Vault roof of building 200 and patching (E)roof as shown in contract documents.
4. New interior partitions, glazing, doors, partitions ceilings electrical, plumbing, mechanical, fire protection and low voltage work, as indicated in the Contract Documents.
5. Finishes, accessories, casework and all other items to provide a new and completely functional expanded Pharmacy Department.
6. All required work effort to maintain the existing functioning of the building and related access and operations. This includes any temporary utility connections/routing required to maintain continuity of electrical, low voltage, communications, med gas, water and sewer to operating portions of the hospital.
7. Reconfiguration of existing electrical and low-voltage conduits, racks, panels, cable trays, etc. to accommodate the new work.
8. **Temporary Space Build-Out, as directed by the VA, to allow Pharmacy to operate during construction of the new pharmacy shown on these drawings.**

B. Visits to the VA Campus site by Bidders may be made only by appointment with the Contracting Officer's Representative. A minimum 3 work-day notice is required for site visits.

C. The VA has contracted separately with an Architect-Engineer firm who will render certain technical services during construction. Such

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services shall be considered as advisory to the VA and shall not be construed as expressing or implying a contractual act of the Government without specific affirmation by the Contracting Officer.

- D. Before placement and installation of work subject to tests by a testing laboratory, the Contractor shall notify the Contracting Officer's Representative in sufficient time to enable VA personnel to be present at the time for adequate oversight of the taking and testing of specimens and field activities. Such prior notice shall be not less than three work days unless otherwise designated by the Contracting Officer's Representative.
- E. All employees of the Contractor and subcontractors shall comply with the VA security management program and obtain permission for site entry from the VA police, be identified by project and employer, and be restricted from unauthorized access.
- F. The Contracting Officer's Representative will assign specific routes and times for pathways, corridors and elevators for transportation of personnel, materials and equipment. The Contractor will continually clean-up any dust, dirt or debris caused by their jobsite ingress/egress.
- G. Dust and fume control will be exercised during all construction operations. Workers will be careful not to operate any vehicles, gas or diesel engines, or to perform any fume or dust generating process near a building air intake system. Noise will be held to a minimum at all times. Jack-hammering, core drilling and other noisy or disturbing operations may have to be rescheduled or accomplished after hours to avoid interfering with surgery or patient care services.
- H Normal working hours are 7:30 A.M. to 4 P.M.

1.2 STATEMENT OF BID ITEM(S)

- A. ITEM I, GENERAL CONSTRUCTION: Work includes general construction, alterations, walks, grading, drainage, mechanical and electrical work, medical equipment, utility systems, water storage facilities and necessary removal of existing structures and construction and certain other items, as shown on the Contract Documents. Deductive Alternates:

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- B. ALTERNATE NO. 1: Furniture & Shelving in Controlled Substances
- C. ALTERNATE NO. 2: Storage Shelving in Breakdown/Storage area
- D. ALTERNATE NO. 3: Pill storage/Shelving in Main Work Area
- E. ALTERNATE NO. 4: Packing stations & Optifill Work stations
- F. ALTERNATE NO. 5: Quartz Countertop replace with Solid surface
- G. ALTERNATE NO. 6: Waiting Room wall protection replace solid surface with FRP
- H. ALTERNATE NO. 7: Reception Resin Art panels to be deleted from scope

1.3 SPECIFICATIONS AND DRAWINGS

- A. After award of contract, specifications and drawings will be available for download from FedBizOpps.
- B. The Contractor shall maintain on the job site one (1) printed set of specifications, one (1) printed set of drawings, one (1) printed copy of all RFI's and any documents that modify the original specifications and drawings.

1.4 ACCIDENT PREVENTION

- A. The Contractor shall provide and maintain work environments and procedures which will:
 - 1. Safeguard the public and Government personnel, property, materials, supplies, and equipment exposed to Contractor operations and activities;
 - 2. Avoid interruptions of Government operations and delays in project completion dates;
 - 3. Control costs in the performance of this contract; and
 - 4. Maintain a safe and healthy worksite to prevent adverse impacts to Contractor and subcontractor employees.
- B. The Contractor shall:
 - 1. Before commencing the work, submit a written Safety Plan for implementing actions to prevent accidents. The plan shall include an

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- analysis of significant hazards to life, limb and property inherent in contract work performance and measures for controlling these hazards and avoiding personnel exposure. Meet with the Contracting Officer's Representative to discuss and develop a mutual understanding relative to administration of the overall safety program and obtain approval for the Contractor's Safety Plan from the Contracting Officer's Representative before work start.
2. Comply with the standards issued by the Secretary of Labor at 29 CFR Part 1926 and 29 CFR Part 1910 (OSHA); and Title 8, California Administrative Code - Construction Standards (CAL OSHA)
 3. Prior to commencing work, provide proof that an OSHA designated competent person (CP) per 29 CFR 1926.20(b)(2)/1926.32(f) will maintain a presence at the work site whenever the Contractor or subcontractors are present.
 4. Provide appropriate safety barricades, signs, signal lights and personal protective equipment (hard hats, goggles, protective shoes, gloves, masks or breathing apparatus, etc). Do not attempt to operate any switch, valve or energy isolation device that is Locked-Out or Tagged-Out. Do not allow entry into trenches or confined space without required protection and employee training.
 5. Ensure all Contractor and subcontractor employees have the 10-hour or 30-hour OSHA Construction Safety course and other relevant competency training, as determined by Contracting Officer's Representative. Submit training records of all such employees for approval before the start of work.
 6. Ensure that any additional measures the Contracting Officer determines to be reasonably necessary for accident protection and safety of personnel are taken.
- C. Whenever the Contracting Officer becomes aware of any noncompliance with safety requirements or any condition which poses a serious or imminent danger to the health or safety of personnel, the Contracting Officer shall notify the Contractor orally, with written confirmation, and request immediate initiation of corrective action. After receiving the

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notice, the Contractor shall immediately take corrective action. If the Contractor fails or refuses to promptly take corrective action, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. The Contractor shall not be entitled to any equitable adjustment of the contract price or extension of the performance schedule on any stop work order issued under this clause.

- D. The Contractor shall insert the above clause with appropriate changes in the designation of the parties in subcontracts.

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 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. Contractor and subcontractor employees shall not enter the project site without an appropriate badge. They will be subject to inspection of their personal effects when entering or leaving the project site.
2. The Contractor shall create an Employee Daily Log of all personnel working on the site. The Employee Daily Log shall contain the employee's (a) Full Name, (b) Employer/Company Name and (c) Occupation/Trade. The Employee Daily Log shall be submitted with the Contractor's Daily Work Report.
3. All work on the contract shall be performed between 7:00 am and 4:00 pm Monday through Friday, excluding National Holidays, unless approved in writing by the Contracting Officer. For working outside the these hours, the Contractor shall give two weeks' notice to the Contracting Officer's Representative so that oversight, security and

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escort arrangements can be provided for the employees. This notice is separate from any notices required for utility shutdown described later in this specification.

4. No photography of VA premises is allowed without written permission of the VA Public Affairs Officer. Submit request to the Contracting Officer's Representative.
5. The VA Police are Federal Police Officers with full authority to make arrests, investigate crimes and issue traffic citations. Citations issued require an appearance in the Federal District Court and/or payment of a fine. Speed limits and other driving and parking codes are strictly enforced. Any vehicle left unattended for more than a few minutes may be cited by the VA Police.
6. Sexual harassment is strictly prohibited. This includes deliberate or unsolicited verbal comments or gestures of a sexual nature, unwelcome sexual advances, requests for sexual favors and/or other unwelcome verbal or physical conduct of a sexual nature.
7. Possession or use of non-prescription drugs or alcohol, including beer and wine, on the Health Care System grounds is strictly prohibited. Possession of firearms, knives with blades over 4", ammunition, explosive devices and any item that may be considered an offensive weapon is strictly prohibited. This includes carrying such items in vehicles.
8. The Health Care System does not have the equipment, facilities, or personnel trained to handle serious injuries. Call 911 for emergency medical assistance and notify the Contracting Officer's Representative and the VA Police.
9. Vehicle authorization requests shall be required for any vehicle entering the site and such requests 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. Separate permits shall be issued for Contractor and subcontractor employees for parking in designated areas only.

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10. VA reserves the right to shut down the project site and order Contractor's employees and subcontractors off the premises in the event of a national emergency or local disaster. The Contractor may return to the site only with the written approval of the Contracting Officer's Representative.

C. Guards: NOT USED

D. Key Control:

1. The Contractor shall provide duplicate keys and lock combinations to the Contracting Officer's Representative for the purpose of security inspections and emergency actions for every area of the project site including tool boxes and parked machines.
2. The Contractor shall turn over all permanent lock cylinders to the VA locksmith for permanent installation.

E. Document Control:

1. Before starting any work, the Contractor 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 manuals 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 access to only those who will need it for the project. Return the information to the Contracting Officer's Representative upon request.
4. These security documents shall not be removed or transmitted from the project site without the written approval of Contracting Officer's Representative.
5. All paper waste or electronic media shall be shredded, destroyed or erased in a manner acceptable to the VA.

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6. Notify Contracting Officer's Representative 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-mails provided all VA encryption procedures are followed.

1.6 FIRE SAFETY

A. Applicable Publications: Publications listed below form part of this Article.

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

E84-13a.....Surface Burning Characteristics of Building
Materials

2. National Fire Protection Association (NFPA):

NFPA 10.....Standard for Portable Fire Extinguishers

NFPA 30.....Flammable and Combustible Liquids Code

NFPA 51.....Standard for Fire Prevention During Welding,
Cutting and Other Hot Work

NFPA 70/NEC.....National Electrical Code

NFPA 101Life Safety Code and all referenced codes and
standards

NFPA 241.....Standard for Safeguarding Construction,
Alteration, and Demolition Operations

3. Occupational Safety and Health Administration (OSHA):

29 CFR 1910/1926.....Safety and Health Regulations for Construction

- B. Fire Safety Plan: Establish and maintain a fire protection program in accordance with 29 CFR 1926 and required Interim Life Safety Measures (ILSM). Prior to start of work, prepare a plan detailing project-specific fire safety measures and ILSMs including periodic status reports, and submit to Contracting Officer's Representative for review for compliance with contract requirements. Prior to any worker for the Contractor or subcontractors beginning work, they shall undergo a safety briefing provided by the Contractor's competent person per OSHA requirements. This briefing shall include information on the construction limits, VA safety guidelines, means of egress, break areas, work hours, locations of restrooms, use of VA equipment, etc. Documentation shall be provided to the Contracting Officer's Representative that individuals have undergone Contractor's safety briefings.
- C. Site and Building Access: Maintain free and unobstructed access to facility emergency services and fire, police and other emergency response forces in accordance with NFPA 241. In the event of a fire or during a fire drill, the Contractor must vacate the construction site if within the zone affected.
- 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 20 feet exposed overall length, separate by 10 feet.
- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer's Representative.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily and report findings and corrective actions weekly to Contracting Officer's Representative.

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- H. Fire Extinguishers: Provide, maintain and show proof of extinguisher maintenance in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Standpipes: Maintain standpipes at each floor in accordance with 29 CFR 1926 and NFPA 241. Do not charge wet standpipes subject to freezing until weather protected.
- K. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers.
- L. Existing Fire Protection: Do not impair automatic sprinklers, smoke and heat detection and fire alarm systems except for portions immediately under construction or temporarily for connections. Provide fire watch for impairments more than 4 hours in a 24-hour period. If a Fire Alarm system or sprinkler system is out of service for more than 4 hours, then the Contractor shall implement Interim Life Safety Measures in accordance with VA San Francisco Health Care System and coordinate with Contracting Officer's Representative. All existing or temporary fire protection systems (fire alarms, sprinklers) located in construction areas shall be tested as coordinated with the Contracting Officer's Representative.
- M. When work requires removal of any ceiling tiles for more than 4 hours in a 24-hour period in areas protected by a fire sprinkler system where the sprinkler heads are made less effective by space above the ceiling exceeding 18 inches, temporary provision shall be made for supplemental heat detectors with annunciation capability to the building/campus fire alarm system. Programmed wireless heat detector sensors (Honeywell #5809 or equal) with associated receiver (Honeywell #5881 or equal) and control panel (Honeywell Vista-20P or equal) are acceptable. Tie-in of the control panel to the building/campus fire alarm system will be made by the VA. Fifteen (15) days advance notice shall be given to the VA for scheduling the tie-in.

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- N. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer's Representative.
- O. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51. Any welding, cutting metal or other burning or spark producing operations will require a hot work permit. Welding and/or burning operations are allowed only during normal working hours. Coordinate with Contracting Officer's Representative to obtain permits from the Facility Safety Officer at least 24 hours in advance. Evidence of training of all personnel assigned to be a fire watch shall be provided before Hot Work Permits will be issued. A fire watch is required for all hot work unless specified differently on the permit. The fire watch shall have fire extinguishing equipment readily available and be trained in its use and be familiar with facilities for sounding an alarm in the event of a fire. They shall watch for fires in all exposed areas, try to extinguish then otherwise sound the alarm. A fire watch shall be maintained for at least 30 minutes after completion of hot work.
- P. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with and report findings and corrective actions weekly to Contracting Officer's Representative.
- Q. Smoking: Smoking is prohibited in all buildings and adjacent construction areas. Smoking is prohibited except in designated smoking areas.
- R. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily. Waste and debris will not be disposed of on station or in VA trash containers or dumpsters. The Contractor shall provide their own bin or dumpster, however, the use and location of such must be approved in writing by the Contracting Officer's Representative. Construction waste and debris will not be accumulated in corridors or other building areas where it might cause a fire or safety hazard.
- S. Smoke/fire Barrier Penetrations: Any penetrations to smoke or fire barrier walls, ceilings or floor slabs shall be properly sealed

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immediately with Hilti Fire Stop 601 or 635 for walls and ceilings and Hilti Fire Stop 657 for floor penetrations or approved equal.

- T. Install one-hour temporary construction partitions as shown on drawings or as required to separate the work site from the occupied portion of the building and maintain integrity of existing exit stair enclosures, exit passageways, fire-rated enclosures of hazardous areas, horizontal exits, smoke barriers, vertical shafts and openings enclosures. 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.
- U. If required, submit documentation to the Contracting Officer's Representative that personnel have been trained in the fire safety aspects of working in areas with impaired structural or compartmentalization features.

1.7 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer's Representative. 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's Representative 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 their expense upon completion of the work. With the written consent of the Contracting Officer's Representative, the buildings and utilities may be abandoned and need not be removed.
- C. The Contractor shall, as prescribed by the Contracting Officer's Representative, use only established roadways, or use temporary roadways constructed by the Contractor when and as authorized by the Contracting Officer's Representative. When materials are transported in prosecuting the work, vehicles shall not be loaded beyond the loading capacity

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recommended by the manufacturer of the vehicle or prescribed by any Federal, State, or local law, code 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 Contracting Officer's Representative.

E. Workmen are subject to rules of the VA Campus applicable to their conduct.

F. Execute work so as to interfere as little as possible with normal functioning of the VA Campus as a whole, including operations of utility services, fire protection systems and any existing equipment, and with work being done by others.

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 the VA in quantities sufficient for not more than two work days. Provide unobstructed access to VA Campus areas required to remain in operation.

3. Contractor to submit plan of laydown and construction materials delivery while on site.

G. Utilities Services: Provide temporary facilities, labor, materials, equipment, connections, and utilities to assure uninterrupted services. Where necessary to cut existing pipes, electrical wires, conduits, cables, etc., of utility services, or of fire protection systems or communications systems, they shall be cut and capped at suitable places where shown; or, in absence of such indication, where directed by Contracting Officer's Representative. All such actions shall be coordinated with any Utility Company involved:

H. Construction Fence: Before construction operations begin, Contractor shall provide a chain link construction fence, six-foot minimum height, around the construction area, material storage areas and dumpsters/waste

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locations. Contractor shall provide and maintain visual screening fabric for all fencing. Contractor shall provide gates as required for access with necessary hardware including hasps and locks. All gates shall be locked when no workers are present. Contractor shall coordinate with the VA to assure VA access at any time. Contractor shall remove the fence when directed by Contracting Officer's Representative.

I. Work areas will be vacated by Government and turned over to Contractor after date of Notice to Proceed and after all pre-construction activities have been completed and pre-construction submittals have been approved by the Contracting Officer's Representative.

J. **Preconstruction Activities include the following:** "As a result of the construction of space currently occupied by Outpatient Pharmacy, SFVAMC has identified swing space for all personnel to move to and operate out of during the course of construction. The Contractor shall build out a swing space for all Outpatient Pharmacy personnel to move into and operate out of while current space is in construction. Location shall be in Building 200 Room 1A-122 for Dispensing/Waiting, as well as 1st Floor of Building 1 for Filling, Processing, Breakdown/Storage, Clerical, and bathrooms. Building 1 space is currently occupied by Research and is separated by key card access from the rest of the campus. They have been moved from the space shown to be converted to temporary Pharmacy use, and all coordination with this user shall be through the COR. Room 1A-122 is currently a conference room and also the Incident Command Center for Emergency and Contingency Operations, and shall be returned to this use after Pharmacy vacates as a result of this project. All wood trim specifically shall be attempted to stay in place, but if necessary shall be removed, salvaged, and reinstalled as is shown in current condition. Contractor shall evaluate all areas and limits of construction for existing conditions, and provide documentation in the form of pictures and formal report to COR showing as such, as well as any potential concerns or items for clarification, before any work is conducted. Refer to corresponding drawings and specifications for temporary swing space. Unless otherwise noted, specification sections not specifically listed shall be assumed to apply to both finished Pharmacy in current location and Swing Space. All items that are necessary for a completed space ready to operate out of

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for a VA Outpatient Pharmacy shall be provided as shown in Building 1 first floor before any work is conducted in the current space to be renovated, and Contractor shall coordinate and assist Pharmacy personnel as directed by the COR during the move into the temporary swing space. Refer to VA design guides and specifications for requirements, though waiver request is included for Building 200 "Teak Room" 1A-122 not meeting specific provisions of Handbook 0730." (See memo following this section.) "Any and all items not specifically stated or shown does not relieve the Contractor of providing a complete and usable space that meets all standards for operation of an Outpatient Pharmacy, to include but not limited to security, infection control, dispensing, etc. Please relay any and all concerns or unknown conditions to the COR immediately when discovered."

- K. When a building is turned over to Contractor, Contractor shall accept entire responsibility 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 (VA 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 the VA Campus at all times.
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 Contracting Officer's Representative. 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 the Contracting Officer's Representative prior knowledge and written approval. Refer to specification Sections 26 05 11, REQUIREMENTS FOR ELECTRICAL

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INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS and 28 05 11, REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATIONS for additional requirements.

2. Contractor shall submit a request to interrupt any such services or systems to Contracting Officer's Representative, in writing, four (4) weeks in advance of proposed interruption. Request shall state reason, date, exact time of, and approximate duration of such interruption. Approved outage dates are not guaranteed and are subject to VA operational requirements.
 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 the VA. Interruption time approved by Contracting Officer's Representative may occur at other than Contractor's normal working hours.
 4. In case of a contract construction emergency, service will be interrupted on approval of Contracting Officer's Representative. Such approval will be confirmed in writing as soon as practical.
 5. Whenever it is required that a connection fee be paid to a public utility provider for new permanent service connection to the construction project, for such items as water, sewer, electricity or gas, payment of such fee shall be paid by the Contractor unless specifically relieved in writing by the Government.
- M. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. 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 VA Campus traffic, comply with the following:
1. The Contractor shall not block any road or street, walkway or building egress without requesting approval from the Contracting

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- Officer's Representative. Submit written request one (1) week prior to proposed blockage. Keep roads, walks and entrances to grounds, to parking and to occupied areas of buildings clear of construction materials, debris and standing construction equipment and vehicles. Wherever excavation for new work crosses existing roads, at least one lane must be open to traffic at all times.
2. Method and scheduling of required cutting, altering and removal of existing roads, walks and entrances must be approved by the Contracting Officer's Representative.
- O. Coordinate this contract with other construction operations as directed by Contracting Officer's Representative. This includes the scheduling of traffic and the use of roadways.

1.8 ALTERATIONS

- A. Survey: Before any work is started, the Contractor shall make a thorough survey with the Contracting Officer's Representative, of buildings areas in which alterations occur and areas which are anticipated routes of access, and furnish a signed report, to the Contracting Officer's Representative. 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 the building.
 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 Contracting Officer's Representative.
- 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 Contracting Officer's Representative to be in such condition that their use is

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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 and VAAR 852.236-88).

C. Re-Survey: Thirty days before expected partial or final inspection date, the Contractor and Contracting Officer's Representative 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 workmen 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. 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.

1.9 INFECTION PREVENTION MEASURES

A. Implement the requirements of VA's Infection Control Risk Assessment (ICRA) team. ICRA Group may monitor dust in the vicinity of the

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construction work and require the Contractor to take corrective action immediately if safe levels are exceeded.

- B. Establish and maintain a dust control program as part of the Contractor's infection preventive measures in accordance with the guidelines provided by ICRA Group. Prior to start of work, prepare a plan detailing project-specific dust protection measures, including periodic status reports, and submit to Contracting Officer's Representative and Facility ICRA team for review for compliance with contract requirements.

1. All personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.

- C. VA Infection Control personnel shall monitor for airborne disease (e.g. aspergillosis) as appropriate during construction. A baseline of conditions may be established by the Contracting Officer's Representative prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality. In addition in patient-care areas:

1. The Contractor, Contracting Officer's Representative and VA Infection Control personnel shall review pressure differential monitoring documentation to verify that pressure differentials in the construction zone and in patient-care areas are appropriate for their settings. The requirement for negative air pressure in the construction zone shall depend on the location and type of activity. Upon notification, the contractor shall implement corrective measures to restore proper pressure differentials as needed. The contractor shall install negative air machines as directed by the Contracting Officer's Representative and shall be required to add machines as directed.
2. In case of a problem the VA, with assistance from the contractor, shall conduct an environmental assessment to find and eliminate the source.

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- D. In general, following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Dampen debris to keep down dust and provide temporary construction partitions in existing structures where directed by Contracting Officer's Representative. Blank off ducts and diffusers to prevent circulation of dust into patient-occupied areas during construction.
 2. Do not perform dust producing tasks within patient-occupied areas without the approval of the Contracting Officer's Representative. For construction in any areas that will remain jointly occupied by the medical Center and Contractor's workers, the Contractor shall:
 - a. Provide dust proof temporary drywall construction barriers to completely separate construction from the operational areas of the hospital in order to contain dirt debris and dust. Construct the dust proof barrier with a one hour fire rating. Barriers shall be sealed and made presentable on hospital occupied side. Install a self-closing rated door in a metal frame, commensurate with the partition, to allow worker access. Maintain negative air at all times. A fire retardant polystyrene, 6-mil thick or greater plastic barrier meeting local fire codes may be used in certain circumstances where hard walls cannot be constructed and an agreement is reached with the Contracting Officer's Representative and VA Fire Protection Specialist.
 - b. HEPA filtration is required. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. Install HEPA (High Efficiency Particulate Accumulator) filter vacuum system rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. Insure continuous negative air pressures occurring within the work area. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Exhaust hoses shall be heavy duty, flexible steel reinforced and exhausted so that dust is not reintroduced to the medical center.

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- c. The contractor shall install a state of the art air pressure differential monitor. The monitor shall be placed at such a location that anyone entering or leaving the work site shall be able to determine if negative air pressure is being maintained.
- d. Adhesive Walk-off/Carpet Walk-off Mats, minimum 24" x 36", shall be used at all interior transitions from the construction area to occupied medical center area. A shop vacuum with HEPA filtration shall be placed at any exit from the work site. These shop vacuums shall be used to remove dust that has accumulated on workers clothing while working whenever they leave the work site. The mats shall be changed as directed by the Contracting Officer's Representative to maintain clean work areas directly outside construction area at all times.
- e. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Shop vacuums and vacuum cleaners shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as they are created. Transport these outside the construction area in containers with tightly fitting lids.
- f. The contractor shall not haul debris through patient-care areas without prior approval of the Contracting Officer's Representative. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with tape. No sharp objects should be allowed to cut through the plastic. Wipe down the wheel treads and the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down. Wheels and tires shall not track debris on floors outside the work zone.
- g. Using a HEPA vacuum, clean inside the barrier and vacuum ceiling tile prior to replacement. Any ceiling access panels opened for investigation beyond sealed areas shall be sealed immediately when unattended.

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- h. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 4 hours. Remove and dispose of porous materials that remain damp for more than 24 hours.
 - i. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.
- E. Final Cleanup:
- 1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
 - 2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
 - 3. All new and existing air ducts shall be cleaned prior to final inspection.

1.10 DISPOSAL AND RETENTION

- A. Materials and equipment accruing from work removed 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 from present locations in such a manner as to prevent damage. Store such items where directed by Contracting Officer's Representative.
 - 2. Items not reserved shall become property of the Contractor and be removed by Contractor.
 - 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

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the VA 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.

4. The Contractor is required to alert the VA immediately in the event any known or suspected hazardous materials are disturbed or will need to be disturbed before proceeding with work. Hazardous materials, such as PCB's, asbestos, lead paint, cleaning solutions and other harmful chemicals shall be disposed of in accordance with federal, state and local laws and regulations. In case of an accidental spill of hazardous materials, the Contractor shall take immediate action to contain the spill and notify the Contracting Officer's Representative. Washing cement, plaster, paint, oil or grease, solvents, etc. into any drains is strictly prohibited. **REPORT ANY ACCIDENTAL SPILLS THAT MAY RUN INTO STORM DRAINS IMMEDIATELY TO ENGINEERING SERVICE.**
5. Contractor shall provide a 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 per SECTION 01 74 19 CONSTRUCTION WASTE MANAGEMENT.

1.11 PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS

- A. The Contractor shall preserve and protect all structures, equipment and vegetation (such as trees, shrubs, and grass) on or adjacent to the work site, which are not to be removed and which do not unreasonably interfere with the work required under this contract. The Contractor shall only remove trees when specifically authorized to do so and shall avoid damaging vegetation that will remain in place. If any limbs or branches of trees are broken during contract performance, or by the careless operation of equipment, or by workmen, the Contractor shall trim those limbs or branches with a clean cut and paint the cut with a tree-pruning compound as directed by the Contracting Officer's Representative.

- 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's Representative may have the necessary work performed and charge the cost to the Contractor.

1.12 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 Contracting Officer's Representative. Existing work to be altered or extended and that which is found to be defective in any way, shall be reported to the Contracting Officer's Representative before it is disturbed. Materials and workmanship used in restoring work, shall conform in type and quality to that of original existing construction, except as otherwise shown or specified.
- B. Upon completion of contract, deliver work complete and undamaged. Existing work (walls, ceilings, partitions, floors, mechanical and electrical work, lawns, paving, roads, walks, etc.) disturbed or removed as a result of performing required new work, shall be patched, repaired, reinstalled, or replaced with new work, and refinished and left in as good condition as existed before commencing work.
- C. At Contractor's own expense, Contractor shall immediately restore to service and repair any damage caused by Contractor's workmen to existing piping and conduits, wires, cables, etc., of utility services or of fire protection systems and communications systems (including telephone, computer network, etc.) which are indicated on drawings or reasonably discovered during execution of the work and which are not scheduled for discontinuance or abandonment.

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- D. Expense of repairs to such utilities and systems not shown on drawings for which locations are unknown and not reasonably discovered will be considered for adjustment to contract time and price in accordance with clause entitled "CHANGES" (FAR 52.243-4 and VAAR 852.236-88) and "DIFFERING SITE CONDITIONS" (FAR 52.236-2).

1.13 LAYOUT OF WORK

- A. The Contractor shall lay out the work and shall be responsible for all measurements in connection with the layout. The Contractor shall furnish, at Contractor's own expense, all templates, equipment, tools, materials, and labor required to lay out any part of the work. The Contractor shall be responsible for executing the work to the lines that may be established or indicated by the Contracting Officer's Representative. The Contractor shall also be responsible for maintaining and preserving all marks established by the Contracting Officer's Representative until authorized to remove them. If such marks are destroyed by the Contractor or through Contractor's negligence before their removal is authorized, the Contracting Officer's Representative may replace them and deduct the expense of the replacement from any amounts due or to become due to the Contractor. (FAR 52.236-17)

1.14 AS-BUILT DRAWINGS

- A. The Contractor shall maintain one full size set of as-built drawings which will be kept current during construction of the project, to include all contract changes, modifications and clarifications.
- B. All variations shall be shown in the same general detail as used in the contract drawings. To insure compliance, as-built drawings shall be made available for the Contracting Officer's Representative's review, as often as requested.
- C. Contractor shall deliver electronic CAD files of approved completed as-built drawings to the Contracting Officer's Representative within 15 calendar days after each completed phase and after the acceptance of the project by the Contracting Officer's Representative.

1.15 USE OF ROADWAYS

- A. For hauling, use only established public roads and roads on the VA Campus and, when authorized by the Contracting Officer's Representative, such temporary roads which are necessary in the performance of contract work. Temporary roads shall be constructed by the Contractor at Contractor's expense. When necessary to cross curbing, sidewalks, or similar construction, they must be protected by well-constructed transitions.

1.16 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 compliance with the following provisions:
1. Permission to use each unit or system must be given by Contracting Officer's Representative. If the equipment is not installed and maintained in accordance with the following provisions, the Contracting Officer's Representative 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. 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 use 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.

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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.

1.17 EXCLUSIVE TEMPORARY USE OF EXISTING ELEVATORS

- A. Exclusive use of existing elevators for handling building materials and Contractor's personnel will be permitted subject to following provisions:
1. Contractor shall coordinate all arrangements with the Contracting Officer's Representative for use of elevators. The Contracting Officer's Representative will ascertain that elevators are in proper condition. 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.

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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.
4. If brake lining of elevators are excessively worn or damaged during temporary use, they shall be removed and replaced with new brake lining.
5. All parts of main controller, starter, relay panel, selector, etc., worn or damaged during temporary use shall be removed and replaced with new parts, if recommended by elevator inspector after elevator is released by Contractor.
6. Place elevator in condition equal, less normal wear, to that existing at time it was placed in service of Contractor as approved by Contracting Officer's Representative.

1.18 TEMPORARY TOILETS

- A. Use of VA facilities allowed on limited basis. Provide temporary facilities where designated by VA Contracting Officer's Representative, (for use of all Contractor and subcontractor employees). Keep such places clean and free from odor or flying insects, and all connections and appliances connected therewith are to be removed prior to completion of contract, and premises left perfectly clean. Temporary toilet location to be designated by VA COR.

1.19 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. If applicable, 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.

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- B. The Contractor, at Contractor's expense and in a workmanlike manner satisfactory to the Contracting Officer's Representative, 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 equipment.
- C. Contractor shall install meters at Contractor's expense and furnish the Contracting Officer's Representative a monthly record of the Contractor's usage of electricity as required.
- 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:
- E. Electricity (for Construction and Testing): Furnish all temporary electric services.
1. Obtain electricity by connecting to the VA Campus 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 VA Campus water distribution system. Provide reduced pressure backflow preventer at each connection. 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 Contracting Officer's Representative's discretion) of use of water from VA Campus system at no cost.

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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 or reimbursed by the Contractor at Contractor's expense.

1.20 NEW TELEPHONE EQUIPMENT

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

1.21 TESTS

- A. 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.
- B. Conduct final tests required in various sections of specifications in presence of the Contracting Officer's Representative. Contractor shall furnish all labor, materials, equipment, instruments, and forms, to conduct and record such tests.
- C. Mechanical and electrical systems shall be balanced, controlled and coordinated. A system is defined as the entire complex 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 complex 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.

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- D. All related components shall be functioning when any system component is tested. Tests shall be completed within a reasonably short period of time during which operating and environmental conditions remain reasonably constant.
- E. 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.

1.22 INSTRUCTIONS

- A. Contractor shall furnish Maintenance and Operating Manuals and verbal instructions when required by the various sections of the specifications and as hereinafter specified.
- B. Manuals: Maintenance and Operating Manuals (two copies each plus pdf file) for each separate piece of equipment shall be delivered to the Contracting Officer's Representative 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 manufacturer representatives to give detailed instructions to assigned VA personnel in the operation and complete maintenance for each piece of equipment. All such training will be at the job site. These requirements

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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 instructions 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 Contracting Officer's Representative and shall be considered concluded only when the Contracting Officer's Representative is satisfied in regard to complete and thorough coverage. The VA reserves the right to request the removal of, and substitution for, any instructor who, in the opinion of the Contracting Officer's Representative, does not demonstrate sufficient qualifications in accordance with requirements for the above.

1.23 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 building.
- C. Storage space for equipment will be provided by the Government and the Contractor shall be prepared to unload and store such equipment therein upon its receipt at the building.
- D. Notify Contracting Officer's Representative 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 the Contracting Officer's Representative. At such time the Contractor shall acknowledge receipt of equipment described, make notations, and immediately furnish the Contracting Officer's Representative with a written statement as to its condition or shortages.

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2. Contractor thereafter is responsible for such equipment until such time as acceptance of contract work is made by the Contracting Officer's Representative.

- E. 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.
- F. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
- G. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.

1.24 RELOCATED EQUIPMENT ITEMS

- A. Contractor shall disconnect, dismantle as necessary, remove and reinstall in new location, all existing equipment and items indicated by symbol "R" or otherwise shown to be relocated by the Contractor.
- B. Perform relocation of such equipment or items at such times and in such a manner as directed by the Contracting Officer's Representative.
- C. 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.

1.25 CONSTRUCTION SIGN

- A. Provide a Construction Sign where directed by the Contracting Officer's Representative. All wood members shall be of framing lumber. Cover sign frame with 24 gage galvanized sheet steel nailed securely around edges

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and on all bearings. Provide three 4 inch by 4 inch posts or equivalent round posts set four feet into ground. Set bottom of sign level at three feet above ground and secure to posts with through bolts. Make posts full height of sign. Brace posts with two by four inch material.

- B. Paint all surfaces of sign and posts two coats of white gloss paint. Border and letters shall be of black gloss paint, except project title which shall be blue gloss paint.
- C. Maintain sign and remove it when directed by the Contracting Officer's Representative.
- D. Detailed drawing of a construction sign showing required legend and other characteristics of sign will be available from the Contracting Officer's Representative.

1.26 SAFETY SIGN

- A. Provide a Safety Sign where directed by Contracting Officer's Representative. Face of sign shall be 3/4 inch thick exterior grade plywood. Provide two four by four inch posts extending full height of sign and three feet into ground. Set bottom of sign level at 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 and approved by Contracting Officer's Representative.
- C. Maintain sign and remove it when directed by Contracting Officer's Representative.
- D. Detailed drawing of a safety sign showing required legend and other characteristics of sign will be available from the Contracting Officer's Representative.
- E. Post the number of accident free days on a daily basis.

1.27 PHOTOGRAPHIC DOCUMENTATION - NOT USED

1.28 FINAL ELEVATION DIGITAL IMAGES - NOT USED

1.29 HISTORIC PRESERVATION

- A. Where the Contractor or any of the Contractor's employees, prior to, or during the construction work, are advised of or discover any possible archeological, historical and/or cultural resources, the Contractor shall immediately notify the Contracting Officer's Representative verbally, and then with a written follow up.

1.30 PROJECT SEQUENCING & OCCUPANCY:

The project shall be sequenced in accordance with the Contract Documents.

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SECTION 01 32 16.15
PROJECT SCHEDULES

PART 1- GENERAL

1.1 DESCRIPTION:

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

1.2 CONTRACTOR'S REPRESENTATIVE:

- A. The Contractor shall designate an authorized representative responsible for the Project Schedule including preparation, review and progress reporting with and to the Contracting Officer's Representative (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 contractor shall provide minimum 2-week look-ahead updates at the jobsite and conduct updates with all primary and subcontractor staff for compliance with progress schedule. The contractor shall allow COR access to meetings involving 2-week look ahead when requested. The COTR shall identify the five different report formats that the contractor shall provide.
- B. Contractor shall conduct weekly meetings with the COR and relevant staff in order to review 2-week look ahead progress, quality control/quality assurance, material deliveries, disposal, discussions with VA, interruptions, notifications, changes in operations, changes in staff, arrival of new staff, badging, workplace orientation, site security, personnel security, use of VA facilities, etc. for review. Contractor shall provide agenda covering all relevant items, conduct the meeting with all prime contractor personnel present and accounted for (superintendent, QC, Safety Officer, PM), and provide minutes of all meetings within 48 hours to all parties involved.
- 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.

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

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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 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS).
- C. In accordance with FAR 52.236 - 1 (PERFORMANCE OF WORK BY THE CONTRACTOR) and VAAR 852.236 - 72 (PERFORMANCE OF WORK BY THE CONTRACTOR), the Contractor shall submit, simultaneously with the cost per work activity/event of the construction schedule required by this Section, a responsibility code for all activities/events of the project for which the Contractor's forces will perform the work.
- D. The Contractor shall cost load work activities/events for all BID ITEMS including ASBESTOS ABATEMENT. The sum of each BID ITEM work shall equal the value of the bid item in the Contractors' bid.

1.7 PROJECT SCHEDULE REQUIREMENTS

- A. Show on the project schedule the sequence of work activities/events required for complete performance of all items of work. The Contractor Shall:
 - 1. Show activities/events such 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.

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- 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. Schedule shall be notated as to allow sorting by columns and categories.
- B. The Contractor shall submit the following supporting data in addition to the project schedule:
1. Narrative of schedule progress against baseline submission, including any changes, omissions, delays, gains, critical path activities.
 2. Cash flow curve showing extent and placement of project in relation to baseline schedule requirements.
- The appropriate project calendar including working days, non workdays, holidays, all separable definable activities, acceptable level of detail, and man-hour loading based on the planned number of shifts per day and 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 // or //the AIA application and certificate for payment documents G702 & G703 // reflecting updated schedule activities and cost data in accordance with the provisions of the following Article, PAYMENT AND PROGRESS REPORTING, as the basis upon which progress payments will be made pursuant to Article, FAR 52.232 - 5 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS) and VAAR 852.236 - 83 (PAYMENT UNDER FIXED-PRICE CONSTRUCTION CONTRACTS). The Contractor shall be entitled to a monthly progress payment upon approval of estimates as determined from the currently approved updated project schedule. Contractor shall submit a proposed cost loaded schedule of values to the COR prior to acceptance of baseline schedule. Prior to monthly payment request an updated schedule of values shall be evaluated jointly with the COR and, upon agreement, submitted for approval through email. Then a progress review meeting will be held each month in order to review the progress, upon which the Contractor may submit the complete and accepted monthly payment in OB10 signed by both the Contractor and COR for acceptance. Monthly payment requests shall include: progress percentage of all work in place at the date of progress update walkthrough (payment is based on work-in-place only), a

listing of all agreed upon project schedule changes and associated data, approved/disapproved materials; 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.

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The analysis shall only include original workday durations and schedule logic agreed upon by the contractor and resident engineer 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 resident engineer. 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 resident engineer 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 VAAR 852.236 - 88 (Changes - Supplemental), and will be based on the complexity of the revision or contract change, man hours expended in analyzing the change, and the total cost of the change.
- E. The cost of revisions to the Project Schedule not resulting from contract changes is the responsibility of the Contractor.

1.12 ADJUSTMENT OF CONTRACT COMPLETION

- A. The contract completion time will be adjusted only for causes specified in this contract. Request for an extension of the contract completion date by the Contractor shall be supported with a justification, CPM data and supporting evidence as the 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

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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) and VAAR 852.236 - 88 (Changes - Supplemental). The Contractor shall include, as a part of each change order proposal, a sketch showing all CPM logic revisions, duration (in work days) changes, and cost changes, for work in question and its relationship to other activities on the approved network diagram.
- D. All delays due to non-work activities/events such as RFI's, WEATHER, STRIKES, and similar non-work activities/events shall be analyzed on a month by month basis.

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SECTION 01 33 23**SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES****PART 1 - GENERAL**

- 1.1 Refer to Articles titled SPECIFICATIONS AND DRAWINGS FOR CONSTRUCTION (FAR52.236-21) and, SPECIAL NOTES (VAAR 852.236-91), in GENERAL CONDITIONS.
- 1.2 For the purposes of this contract, samples (including laboratory samples to be tested)], Submit for approval, all of the items specifically mentioned under the separate sections of the previously referenced requirements. The following text refers to all items collectively as SUBMITTALS.
- 1.3 Submit for approval, all of the items specifically mentioned under the separate sections of the specification, with information sufficient to evidence full compliance with contract requirements. Materials, fabricated articles and the like to be installed in permanent work shall equal those of approved submittals. After an item has been approved, no change in brand or make will be permitted unless:
 - A. Satisfactory written evidence is presented to, and approved by Contracting Officer, that manufacturer cannot make scheduled delivery of approved item or;
 - B. Item delivered has been rejected and substitution of a suitable item is an urgent necessity or;
 - C. Other conditions become apparent which indicates approval of such substitute item to be in best interest of the Government.
- 1.4 Forward submittals in sufficient time to permit proper consideration and approval action by Government. Time submission to assure adequate lead time for procurement of contract - required items. Delays attributable to untimely and rejected submittals will not serve as a basis for extending contract time for completion. Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in contract time for completion.
- 1.5 Submittals will be reviewed for compliance with contract requirements by Architect-Engineer, and action thereon will be taken by Contracting Officer's Representative on behalf of the Contracting Officer.
- 1.6 Upon receipt of submittals, Architect-Engineer will assign a file number thereto. Contractor, in any subsequent correspondence, shall refer to this file and identification number to expedite replies relative to previously approved or disapproved submittals.
- 1.7 The Government reserves the right to require additional submittals, whether or not particularly mentioned in this contract. If additional submittals

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

- 1.8 Schedules called for in specifications and shown on shop drawings shall be submitted for use and information of Department of Veterans Affairs and Architect-Engineer. However, the Contractor shall assume responsibility for coordinating and verifying schedules. The Contracting Officer and Architect-Engineer assumes no responsibility for checking schedules or layout drawings for exact sizes, exact numbers and detailed positioning of items.
- 1.9 Submittals must be submitted by Contractor only and shipped prepaid. Contracting Officer assumes no responsibility for checking quantities or exact numbers included in such submittals.
 - A. Submit samples required by Section 09 06 00, SCHEDULE FOR FINISHES, in quadruplicate. Submit other samples in single units unless otherwise specified. Submit shop drawings, schedules, manufacturers' literature and data, and certificates in quadruplicate, except where a greater number is specified.
 - B. Submittals will receive consideration only when covered by a transmittal letter signed by Contractor. Letter shall be sent via first class mail, or E-mail if allowed by Project Engineer/COR, and shall contain the list of items, name of Medical Center, name of Contractor, contract number, applicable specification paragraph numbers, applicable drawing numbers (and other information required for exact identification of location for each item), manufacturer and brand, ASTM or Federal Specification Number (if any) and such additional information as may be required by specifications for particular item being furnished. In addition, catalogs shall be marked to indicate specific items submitted for approval.
 1. A copy of letter must be enclosed with items, and any items received without identification letter will be considered "unclaimed goods" and held for a limited time only.
 2. Each sample, certificate, manufacturers' literature and data shall be labeled to indicate the name and location of the Medical Center, name of Contractor, manufacturer, brand, contract number and ASTM or Federal Specification Number as applicable and location(s) on project.
 3. Required certificates shall be signed by an authorized representative of manufacturer or supplier of material, and by Contractor.
 - C. In addition to complying with the applicable requirements specified in preceding Article 1.9, samples which are required to have Laboratory Tests (those preceded by symbol "LT" under the separate sections of the specification shall be tested, at the expense of Contractor, in a commercial laboratory approved by Contracting Officer.
 1. Laboratory shall furnish Contracting Officer with a certificate stating that it is fully equipped and qualified to perform intended work, is fully acquainted with specification requirements and intended use of materials and is an independent establishment in no

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- way connected with organization of Contractor or with manufacturer or supplier of materials to be tested.
2. Certificates shall also set forth a list of comparable projects upon which laboratory has performed similar functions during past five years.
 3. Samples and laboratory tests shall be sent directly to approved commercial testing laboratory.
 4. Contractor shall send a copy of transmittal letter to both Contracting Officer's Representative and to Architect-Engineer simultaneously with submission of material to a commercial testing laboratory.
 5. Laboratory test reports shall be sent directly to Contracting Officer's Representative for appropriate action.
 6. Laboratory reports shall list contract specification test requirements and a comparative list of the laboratory test results. When tests show that the material meets specification requirements, the laboratory shall so certify on test report.
 7. Laboratory test reports shall also include a recommendation for approval or disapproval of tested item.
- D. If submittal samples have been disapproved, resubmit new samples as soon as possible after notification of disapproval. Such new samples shall be marked "Resubmitted Sample" in addition to containing other previously specified information required on label and in transmittal letter.
- E. Approved samples will be kept on file by the Contracting Officer's Representative at the site until completion of contract, at which time such samples will be delivered to Contractor as Contractor's property. Where noted in technical sections of specifications, approved samples in good condition may be used in their proper locations in contract work. At completion of contract, samples that are not approved will be returned to Contractor only upon request and at Contractor's expense. Such request should be made prior to completion of the contract. Disapproved samples that are not requested for return by Contractor will be discarded after completion of contract.
- F. Submittal drawings (shop, erection or setting drawings) and schedules, required for work of various trades, shall be checked before submission by technically qualified employees of Contractor for accuracy, completeness and compliance with contract requirements. These drawings and schedules shall be stamped and signed by Contractor certifying to such check.
1. For each drawing required, submit one legible photographic paper or vellum reproducible.
 2. Reproducible shall be full size.
 3. Also provide submittals that do not consist of samples in digital format for dissemination and review. At the Contracting Officer's Representative's option, the requirement for hard copies of submittals may be waived.
 4. Each drawing shall have marked thereon, proper descriptive title, including Medical Center location, project number, manufacturer's

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number, reference to contract drawing number, detail Section Number, and Specification Section Number.

5. A space 120 mm by 125 mm (4-3/4 by 5 inches) shall be reserved on each drawing to accommodate approval or disapproval stamp.
 6. Submit drawings, ROLLED WITHIN A MAILING TUBE, fully protected for shipment.
 7. One reproducible print of approved or disapproved shop drawings will be forwarded to Contractor.
 8. When work is directly related and involves more than one trade, shop drawings shall be submitted to Architect-Engineer under one cover.
- 1.10 Samples, shop drawings, test reports, certificates and manufacturers' literature and data, shall be submitted for approval to:

The Design Partnership, LLP
1629 Telegraph Avenue
Suite 500
Oakland, CA 94612

- 1.11 At the time of transmittal to the Architect-Engineer, the Contractor shall also send a copy of the complete submittal directly to the Contracting Officer's Representative.
- 1.12 Acceptance by government does not relieve contractor of submitting complete and accurate submittals.
- 1.13 Contractor shall submit a submittal register for anticipated submittals, with submittal dates, within 21 days of Notice to Proceed, in the format requested by the VA.

PART 2 - PRODUCTS (Not used)**PART 3 - EXECUTION (Not used)**

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**SECTION 01 35 26
SAFETY REQUIREMENTS**

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**SECTION 01 35 26
SAFETY REQUIREMENTS**

1.0 OVERVIEW:

- A. Maintain essential medical functions and utilities. All work should proceed such that all operations and functions shall continue unhindered unless official utility shutdown is requested and all notifications and coordination accomplished before being executed.

1.1 APPLICABLE PUBLICATIONS:

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

- B. American Society of Safety Engineers (ASSE):

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

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

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

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

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

- D. The Facilities Guidelines Institute (FGI):

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

- E. National Fire Protection Association (NFPA):

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

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

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

70-2014.....National Electrical Code

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

70E-2012Standard for Electrical Safety in the Workplace

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

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

F. The Joint Commission (TJC)

TJC ManualComprehensive Accreditation and Certification
Manual

G. U.S. Nuclear Regulatory Commission

10 CFR 20Standards for Protection Against Radiation

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

29 CFR 1904Reporting and Recording Injuries & Illnesses

29 CFR 1910Safety and Health Regulations for General
Industry

29 CFR 1926Safety and Health Regulations for Construction
Industry

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

I. VHA Directive 2005-007

1.2 DEFINITIONS:

A. OSHA "Competent Person" (CP). One who is capable of identifying existing
and predictable hazards in the surroundings and working conditions which
are unsanitary, hazardous or dangerous to employees, and who has the

authorization to take prompt corrective measures to eliminate them (see 29 CFR 1926.32(f)).

- B. "Qualified Person" means one who, by possession of a recognized degree, certificate, or professional standing, or who by extensive knowledge, training and experience, has successfully demonstrated his ability to solve or resolve problems relating to the subject matter, the work, or the project.
- C. High Visibility Accident. Any mishap which may generate publicity or high visibility.
- D. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does not include first aid treatment even though provided by a physician or registered personnel.
- E. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:
 - 1. Death, regardless of the time between the injury and death, or the length of the illness;
 - 2. Days away from work (any time lost after day of injury/illness onset);
 - 3. Restricted work;
 - 4. Transfer to another job;
 - 5. Medical treatment beyond first aid;
 - 6. Loss of consciousness; or
 - 7. A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as

incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations, including Cal-OSHA requirements. 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's Representative.

1.4 ACCIDENT PREVENTION PLAN (APP):

- A. The APP (aka Construction Safety & Health Plan) shall interface with the Contractor's overall safety and health program. Include any portions of the Contractor's overall safety and health program referenced in the APP in the applicable APP element and ensure it is site-specific. The Government considers the Prime Contractor to be the "controlling authority" for all worksite safety and health of each subcontractor(s). Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out.
- B. The APP shall be prepared as follows:
 - 1. Written in English by a qualified person who is employed by the Prime Contractor articulating the specific work and hazards pertaining to the contract (model language can be found in ASSE A10.33). Specifically articulating the safety requirements found within these VA contract safety specifications.
 - 2. Address both the Prime Contractors and the subcontractors work operations.
 - 3. State measures to be taken to control hazards associated with materials, services, or equipment provided by suppliers.
 - 4. Address all the elements/sub-elements and in order as follows:

a. **SIGNATURE SHEET.** Title, signature, and phone number of the following:

- 1) Plan preparer (Qualified Person such as corporate safety staff person or contracted Certified Safety Professional with construction safety experience);
- 2) Plan approver (company/corporate officers authorized to obligate the company);
- 3) Plan concurrence (e.g., Chief of Operations, Corporate Chief of Safety, Corporate Industrial Hygienist, project manager or superintendent, project safety professional). Provide concurrence of other applicable corporate and project personnel (Contractor).

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

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

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

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

- 1) A statement of the employer's ultimate responsibility for the implementation of his SOH program;

- 2) Identification and accountability of personnel responsible for safety at both corporate and project level. Contracts specifically requiring safety or industrial hygiene personnel shall include a copy of their resumes.
 - 3) The names of Competent and/or Qualified Person(s) and proof of competency/qualification to meet specific OSHA Competent/Qualified Person(s) requirements must be attached.;
 - 4) Requirements that no work shall be performed unless a designated competent person is present on the job site;
 - 5) Requirements for pre-task Activity Hazard Analysis (AHAs);
 - 6) Lines of authority;
 - 7) Policies and procedures regarding noncompliance with safety requirements (to include disciplinary actions for violation of safety requirements) should be identified;
- e. SUBCONTRACTORS AND SUPPLIERS.** If applicable, provide procedures for coordinating SOH activities with other employers on the job site:
- 1) Identification of subcontractors and suppliers (if known);
 - 2) Safety responsibilities of subcontractors and suppliers.
- f. TRAINING.**
- 1) Site-specific SOH orientation training at the time of initial hire or assignment to the project for every employee before working on the project site is required.
 - 2) Mandatory training and certifications that are applicable to this project (e.g., explosive actuated tools, crane operator, rigger, crane signal person, fall protection, electrical lockout/NFPA 70E, machine/equipment lockout, confined space, etc...) and any requirements for periodic retraining/recertification are required.

- 3) Procedures for ongoing safety and health training for supervisors and employees shall be established to address changes in site hazards/conditions.
- 4) OSHA 10-hour training is required for all workers on site and the OSHA 30-hour training is required for Trade Competent Persons (CPs)

g. SAFETY AND HEALTH INSPECTIONS.

- 1) Specific assignment of responsibilities for a minimum daily job site safety and health inspection during periods of work activity: Who will conduct (e.g., "Site Safety and Health CP"), proof of inspector's training/qualifications, when inspections will be conducted, procedures for documentation, deficiency tracking system, and follow-up procedures.
- 2) Any external inspections/certifications that may be required (e.g., contracted CSP or CSHT)

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

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

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

- 1) Emergency response ; Emergency response plan shall have route to nearest hospital posted, along with emergency area of refuge, both posted visibly at project site.
- 2) Contingency for severe weather;
- 3) Fire Prevention ;
- 4) Medical Support;
- 5) Posting of emergency telephone numbers;
- 6) Prevention of alcohol and drug abuse;
- 7) Site sanitation (housekeeping, drinking water, toilets);
- 8) Night operations and lighting ;
- 9) Hazard communication program;
- 10) Welding/Cutting "Hot" work ;
- 11) Electrical Safe Work Practices (Electrical LOTO/NFPA 70E);
- 12) General Electrical Safety
- 13) Hazardous energy control (Machine LOTO);
- 14) Site-Specific Fall Protection & Prevention;
- 15) Excavation/trenching;
- 16) Asbestos abatement;
- 17) Lead abatement;
- 18) Crane Critical lift;
- 19) Respiratory protection;
- 20) Health hazard control 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) Construction in Confined Space work plan.

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

D. Once accepted by the Contracting Officer's 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, 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's Representative project superintendent, project overall designated OSHA Competent Person, and facility Contracting Officer Representative. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment. Notify Contracting Officer of severe hazard exposure, i.e. imminent danger immediately, but not less than 24 hours of discovery.

1.5 ACTIVITY HAZARD ANALYSES (AHAS):

A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous

project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site). Review list of possible work activities with COR. Each definable feature of work shall have an AHA, such that every aspect of the project is covered, or when new crews or a new competent person for the feature in question comes on site. AHA's shall cover every particular hazard that could be anticipated in the type of work encountered. All aspects of work shall be covered by an AHA.

- 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's Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.
 - 1. The names of the Competent/Qualified Person(s) required for a particular activity (for example, excavations, scaffolding, fall protection, other activities as specified by OSHA and/or other State and Local agencies) shall be identified and included in the AHA. Certification of their competency/qualification shall be submitted to the Government Designated Authority (GDA) for acceptance prior to the start of that work activity.
 - 2. The AHA shall be reviewed and modified as necessary to address changing site conditions, operations, or change of competent/qualified person(s).
 - a. If more than one Competent/Qualified Person is used on the AHA activity, a list of names shall be submitted as an attachment to the AHA. Those listed must be Competent/Qualified for the type of

work involved in the AHA and familiar with current site safety issues.

- b. If a new Competent/Qualified Person (not on the original list) is added, the list shall be updated (an administrative action not requiring an updated AHA). The new person shall acknowledge in writing that he or she has reviewed the AHA and is familiar with current site safety issues.
3. Submit AHAs to the Contracting Officer's Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES for review at least 15 calendar days prior to the start of each phase. Subsequent AHAs as shall be formatted as amendments to the APP. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.
4. The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.
5. Develop the activity hazard analyses using the project schedule as the basis for the activities performed. All activities listed on the project schedule will require an AHA. The AHAs will be developed by the contractor, supplier, or subcontractor and provided to the prime contractor for review and approval and then submitted to the Contracting Officer's Representative.

1.6 PRECONSTRUCTION CONFERENCE:

- A. Contractor representatives who have a responsibility or significant role in implementation of the accident prevention program, as required by 29 CFR 1926.20(b)(1), on the project shall attend the preconstruction conference to gain a mutual understanding of its implementation. This includes the project superintendent, subcontractor superintendents, and any other assigned safety and health professionals. Mutual Understanding conference shall include all

relevant contractor site personnel, including project superintendent, SSHO, QC, etc.

- B. Discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, establish a schedule for the preparation, submittal, review, and acceptance of AHAs to preclude project delays.
- C. Deficiencies in the submitted APP will be brought to the attention of the Contractor within 14 days of submittal, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Do not begin work until there is an accepted APP.

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

- A. The Prime Contractor shall designate a minimum of one SSHO at each project site that will be identified as the SSHO to administer the Contractor's safety program and government-accepted Accident Prevention Plan. Each subcontractor shall designate a minimum of one CP in compliance with 29 CFR 1926.20 (b)(2) that will be identified as a CP to administer their individual safety programs.
- B. Further, all specialized Competent Persons for the work crews will be supplied by the respective contractor as required by 29 CFR 1926 (i.e. Asbestos, Electrical, Cranes, & Derricks, Demolition, Fall Protection, Fire Safety/Life Safety, Ladder, Rigging, 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).

- 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). The number, severity, and/or iterations of presence of uncontrolled hazards will be evaluated before CP being deemed incompetent. Low risk shall generally be a three strike rule, medium/high risk shall have written warning and possible suspension from work site, while repeated medium/high risk hazard shall employ removal of employee. All hazards shall be reported to CP and SSHO, deficiency recorded, and corrective actions taken up to and until removal of personnel from site permanently.

1.8 TRAINING:

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

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

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Contracting Officer's Representative.
- B. A Certified Safety Professional (CSP) with specialized knowledge in construction safety or a certified Construction Safety and Health Technician (CSHT) shall randomly conduct a monthly site safety inspection. The CSP or CSHT can be a corporate safety professional or independently contracted. The CSP or CSHT will provide their certificate number on the required report for verification as necessary.
 - 1. Results of the inspection will be documented with tracking of the identified hazards to abatement.
 - 2. The Contracting Officer's 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's Representative // within one week of the onsite inspection.

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

- A. Notify the Contracting Officer's Representative as soon as practical, but no more than four hours after any accident meeting the definition of OSHA Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$5,000, or any weight handling equipment accident. Within notification include contractor name;

contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Contracting Officer's Representative determine whether a government investigation will be conducted.

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

1.11 PERSONAL PROTECTIVE EQUIPMENT (PPE):

- A. PPE is governed in all areas by the nature of the work the employee is performing. For example, specific PPE required for performing work on electrical equipment is identified in NFPA 70E, Standard for Electrical Safety in the Workplace.

- B. Mandatory PPE includes:

- 1. Hard Hats - unless written authorization is given by the Contracting Officer's Representative in circumstances of work operations that have limited potential for falling object hazards such as during

finishing work or minor remodeling. With authorization to relax the requirement of hard hats, if a worker becomes exposed to an overhead falling object hazard, then hard hats would be required in accordance with the OSHA regulations.

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

1.12 INFECTION CONTROL

- A. Infection Control is critical in all medical center facilities. Interior construction activities causing disturbance of existing dust, or creating new dust, must be conducted within ventilation-controlled areas that minimize the flow of airborne particles into patient areas. Exterior construction activities causing disturbance of soil or creates dust in some other manner must be controlled.
- B. Consult with COR and Infection Control Representative for specific requirements of ICRA. After these items have been confirmed, document existing conditions and notify COR 3 days in advance of completion of Infection Control measures in initial project setup. COR will notify and Infection Control Representative will inspect for compliance. Approved ICRA signed by COR, IC rep, and Contractor will be posted visibly at project site.

C. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control Risk Assessment (ICRA)). The ICRA procedure found on the American Society for Healthcare Engineering (ASHE) website will be utilized. Risk classifications of Class II or lower will require approval by the Contracting Officer's Representative before beginning any construction work. Risk classifications of Class III or higher will require a permit before beginning any construction work. Infection Control permits will be issued by the Contracting Officer's Representative. The Infection Control Permits will be posted outside the appropriate construction area. More than one permit may be issued for a construction project if the work is located in separate areas requiring separate classes. The primary project scope area for this project is: **Class IV**, however, work outside the primary project scope area may vary. The required infection control precautions with each class are as follows:

1. Class I requirements:

a. During Construction Work:

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

b. Upon Completion:

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

2. Class II requirements:

a. During Construction Work:

- 1) Notify the Contracting Officer's Representative //

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

b. Upon Completion:

- 1) Wipe work surfaces with cleaner/disinfectant.
- 2) Contain construction waste before transport in tightly covered containers.
- 3) Wet mop and/or vacuum with HEPA filtered vacuum before leaving work area.
- 4) Upon completion, restore HVAC system where work was performed
- 5) Notify the Contracting Officer's Representative

3. Class III requirements:

a. During Construction Work:

- 1) Obtain permit from the Contracting Officer's Representative
- 2) Remove or Isolate HVAC system in area where work is being done to prevent contamination of duct system.
- 3) Complete all critical barriers i.e. sheetrock, plywood, plastic, to seal area from non work area or implement control cube method (cart with plastic covering and sealed connection to work site with HEPA vacuum for vacuuming prior to exit) before construction begins. Install construction barriers and ceiling protection carefully, outside of normal work hours.

- 4) Maintain negative air pressure, 0.01 inches of water gauge, within work site utilizing HEPA equipped air filtration units and continuously monitored with a digital display, recording and alarm instrument, which must be calibrated on installation, maintained with periodic calibration and monitored by the contractor.
- 5) Contain construction waste before transport in tightly covered containers.
- 6) Cover transport receptacles or carts. Tape covering unless solid lid.

b. Upon Completion:

- 1) Do not remove barriers from work area until completed project is inspected by the Contracting Officer's Representative // and thoroughly cleaned by the VA Environmental Services Department.
- 2) Remove construction barriers and ceiling protection carefully to minimize spreading of dirt and debris associated with construction, outside of normal work hours.
- 3) Vacuum work area with HEPA filtered vacuums.
- 4) Wet mop area with cleaner/disinfectant.
- 5) Upon completion, restore HVAC system where work was performed.
- 6) Return permit to the Contracting Officer's Representative //

4. Class IV requirements:

a. During Construction Work:

- 1) Obtain permit from the Contracting Officer's Representative
- 2) Isolate HVAC system in area where work is being done to prevent contamination of duct system.

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

b. Upon Completion:

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

7) Upon completion, restore HVAC system where work was performed.

8) Return permit to the Contracting Officer's Representative //

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

1. Class III and IV - closed door with masking tape applied over the frame and door is acceptable for projects that can be contained in a single room.
2. Construction, demolition or reconstruction not capable of containment within a single room must have the following barriers erected and made presentable on hospital occupied side:
 - a. Class III & IV (where dust control is the only hazard, and an agreement is reached with the Resident Engineer and Medical Center) - Airtight plastic barrier that extends from the floor to ceiling. Seams must be sealed with duct tape to prevent dust and debris from escaping
 - b. Class III & IV - Drywall barrier erected with joints covered or sealed to prevent dust and debris from escaping.
 - c. Class III & IV - Seal all penetrations in existing barrier airtight
 - d. Class III & IV - Barriers at penetration of ceiling envelopes, chases and ceiling spaces to stop movement air and debris
 - e. Class IV only - Anteroom or double entrance openings that allow workers to remove protective clothing or vacuum off existing clothing
 - f. Class III & IV - At elevators shafts or stairways within the field of construction, overlapping flap minimum of two feet wide of polyethylene enclosures for personnel access.

E. Products and Materials:

1. Sheet Plastic: Fire retardant polystyrene, 6-mil thickness meeting local fire codes
 2. Barrier Doors: Self Closing Two-hour solid core wood in steel frame, painted
 3. Dust proof two-hour fire-rated drywall
 4. High Efficiency Particulate Air-Equipped filtration machine rated at 95% capture of 0.3 microns including pollen, mold spores and dust particles. HEPA filters should have ASHRAE 85 or other prefilter to extend the useful life of the HEPA. Provide both primary and secondary filtrations units. Maintenance of equipment and replacement of the HEPA filters and other filters will be in accordance with manufacturer's instructions.
 5. Exhaust Hoses: Heavy duty, flexible steel reinforced; Ventilation Blower Hose
 6. Adhesive Walk-off Mats: Provide minimum size mats of 24 inches x 36 inches
 7. Disinfectant: Hospital-approved disinfectant or equivalent product
 8. Portable Ceiling Access Module
- F. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- G. A dust control program will be establish and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to Contracting Officer's Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

H. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.

H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.

1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center. Coordinate all connections to SFVAMC HVAC, or any other utility connections, with COR in advance (10 working days). Anything requiring utility shutdown will require three weeks notice minimum to COR. COR will forward to shutdown review committee.
2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
5. The contractor shall not haul debris through patient-care areas without prior approval of the Resident Engineer and the Medical Center. When, approved, debris shall be hauled in enclosed dust proof containers or wrapped in plastic and sealed with duct tape. No sharp objects should be allowed to cut through the plastic. Wipe

- down the exterior of the containers with a damp rag to remove dust. All equipment, tools, material, etc. transported through occupied areas shall be made free from dust and moisture by vacuuming and wipe down. No debris shall be hauled through patient care areas. No authorization will be given for this act.
6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
 7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

1. Upon completion of project, or as work progresses, remove all construction debris from above ceiling, vertical shafts and utility chases that have been part of the construction.
2. Perform HEPA vacuum cleaning of all surfaces in the construction area. This includes walls, ceilings, cabinets, furniture (built-in or free standing), partitions, flooring, etc.
3. All new air ducts shall be cleaned prior to final inspection.
4. Remove all existing items not-in-service and not installed in project from in-wall or above ceiling.

J. Exterior Construction

1. Contractor shall verify that dust will not be introduced into the medical center through intake vents, or building openings. HEPA filtration on intake vents is required where dust may be introduced. Conduct walkthrough with COR to verify exterior conditions.
2. Dust created from disturbance of soil such as from vehicle movement will be wetted with use of a water truck as necessary

3. All cutting, drilling, grinding, sanding, or disturbance of materials shall be accomplished with tools equipped with either local exhaust ventilation (i.e. vacuum systems) or wet suppression controls.

1.13 TUBERCULOSIS SCREENING

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

1.14 FIRE SAFETY

- A. Fire Safety Plan: Establish and maintain a site-specific fire protection program in accordance with 29 CFR 1926. Prior to start of work, prepare a plan detailing project-specific fire safety measures,

including periodic status reports, and submit to Contracting Officer's Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. This plan may be an element of the Accident Prevention Plan.

- B. Site and Building Access: Maintain free and unobstructed access to facility emergency services and for fire, police and other emergency response forces in accordance with NFPA 241.
- C. Separate temporary facilities, such as trailers, storage sheds, and dumpsters, from existing buildings and new construction by distances in accordance with NFPA 241. For small facilities with less than 6 m (20 feet) exposing overall length, separate by 3m (10 feet).
- D. 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 treated plywood (flame spread rating of 25 or less in accordance with ASTM E84) on both sides of fire retardant treated wood 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 two-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.

4. Fire Suppression System shall be installed such that utility interruption is limited to the minimum time possible. If any utility is shutdown the COR will need 4 weeks' notice in order to submit a shutdown notice to facilities and through Public Affairs Office. The notice shall include purpose of shutdown, system to be shutdown, length of shutdown, days and times to be conducted, and exact location (Building, Floor, Room #). If the system is shutdown for more than 4 hours, Interim Life Safety Measures shall be put into place for the duration of the shutdown that ensure equivalency of protection and notification of the existing systems.

- E. Temporary Heating and Electrical: Install, use and maintain installations in accordance with 29 CFR 1926, NFPA 241 and NFPA 70.
- F. Means of Egress: Do not block exiting for occupied buildings, including paths from exits to roads. Minimize disruptions and coordinate with Contracting Officer's Representative.
- G. Egress Routes for Construction Workers: Maintain free and unobstructed egress. Inspect daily. Report findings and corrective actions weekly to Contracting Officer's Representative.
- H. Fire Extinguishers: Provide and maintain extinguishers in construction areas and temporary storage areas in accordance with 29 CFR 1926, NFPA 241 and NFPA 10.
- I. Flammable and Combustible Liquids: Store, dispense and use liquids in accordance with 29 CFR 1926, NFPA 241 and NFPA 30.
- J. Sprinklers: Install, test and activate new automatic sprinklers prior to removing existing sprinklers, at Contracting Officer's Representative's discretion.
- L. 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's 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 Resident Engineer.

- M. Smoke Detectors: Prevent accidental operation. Remove temporary covers at end of work operations each day. Coordinate with Contracting Officer's Representative.
- N. Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer's Representative. Obtain permits from Contracting Officer's Representative and facility Safety Officer at least 72 hours in advance, or as designated by the Contracting Officer's Representative. Designate contractor's responsible project-site fire prevention program manager to permit hot work.
- O. Fire Hazard Prevention and Safety Inspections: Inspect entire construction areas weekly. Coordinate with, and report findings and corrective actions weekly to Contracting Officer's Representative.
- P. 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.
- Q. Dispose of waste and debris in accordance with NFPA 241. Remove from buildings daily.

1.15 ELECTRICAL

- A. All electrical work shall comply with NFPA 70 (NEC), NFPA 70B, NFPA 70E, 29 CFR Part 1910 Subpart J - General Environmental Controls, 29 CFR Part 1910 Subpart S - Electrical, and 29 CFR 1926 Subpart K in addition to other references required by contract.

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

3. Personal Protective Equipment (PPE) and electrical testing instruments will be readily available for inspection by the The Chief Engineer and/or Contracting Officer's Representative.

D. Before beginning any electrical work, an Activity Hazard Analysis (AHA) will be conducted to include Shock Hazard and Arc Flash Hazard analyses (NFPA Tables can be used only as a last alternative and it is strongly suggested a full Arc Flash Hazard Analyses be conducted). Work shall not begin until the AHA for the work activity has been accepted by the Contracting Officer's Representative and discussed with all engaged in the activity, including the Contractor, subcontractor(s), and Government on-site representatives at preparatory and initial control phase meetings.

E. Ground-fault circuit interrupters. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites shall have approved ground-fault circuit interrupters for personnel protection. "Assured Equipment Grounding Conductor Program" only is not allowed.

1.16 FALL PROTECTION

A. The fall protection (FP) threshold height requirement is 6 ft (1.8 m) for ALL WORK, unless specified differently or the OSHA 29 CFR 1926 requirements are more stringent, to include steel erection activities, systems-engineered activities (prefabricated) metal buildings, residential (wood) construction and scaffolding work.

1. The use of a Safety Monitoring System (SMS) as a fall protection method is prohibited.

2. The use of Controlled Access Zone (CAZ) as a fall protection method is prohibited.

3. A Warning Line System (WLS) may ONLY be used on floors or flat or low-sloped roofs (between 0 - 18.4 degrees or 4:12 slope) and shall be erected around all sides of the work area (See 29 CFR 1926.502(f) for construction of WLS requirements). Working within the WLS does not require FP. No worker shall be allowed in the area between the

roof or floor edge and the WLS without FP. FP is required when working outside the WLS.

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

1.17 SCAFFOLDS AND OTHER WORK PLATFORMS

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

- 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.

1.18 EXCAVATION AND TRENCHES

- A. All excavation and trenching work shall comply with 29 CFR 1926 Subpart P.
- B. All excavations and trenches 5 feet in depth or greater shall require a written trenching and excavation permit (NOTE - some States and other local jurisdictions require separate state/jurisdiction-issued excavation permits). The permit shall be completed and provided to the Contracting Officer's Representative and/or Facility Safety Officer and/or other Government Designated Authority prior to commencing work for the day. At the end of the day, the permit shall be closed out and provided to the Contracting Officer's Representative. The permit shall be maintained onsite and include the following:
1. Determination of soil classification
 2. Indication that utilities have been located and identified. If utilities could not be located after all reasonable attempt, then excavating operations will proceed cautiously.
 3. Indication of selected excavation protective system.
 4. Indication that the spoil pile will be stored at least 2 feet from the edge of the excavation and safe access provided within 25 feet of the workers.
 5. Indication of assessment for a potential toxic, explosive, or oxygen deficient atmosphere.
- C. If not using an engineered protective system such as a trench box, shielding, shoring, or other Professional Engineer designed system and using a sloping or benching system, soil classification cannot be Solid Rock or Type A. All soil will be classified as Type B or Type C and sloped or benched in accordance with Appendix B of 29 CFR 1926.

1.19 CRANES

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

1.20 CONTROL OF HAZARDOUS ENERGY (LOCKOUT/TAGOUT)

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

1.21 WELDING AND CUTTING

As specified in section 1.14, Hot Work: Perform and safeguard hot work operations in accordance with NFPA 241 and NFPA 51B. Coordinate with Contracting Officer's Representative and/or Facility Safety Officer and/or other Government Designated Authority. Obtain permits from Contracting Officer's Representative at least 72 hours in advance.

1.22 LADDERS

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

1.23 FLOOR & WALL OPENINGS

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

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

- - - E N D - - -

SECTION 01 42 19**REFERENCE STANDARDS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. 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)

- A. The specifications and standards cited in this solicitation can be examined at the following location:
1. DEPARTMENT OF VETERANS AFFAIRS,
Office of Construction & Facilities Management
Facilities Quality Service (00CFM1A)
425 Eye Street N.W, (sixth floor)
Washington, DC 20001
Telephone Numbers: (202) 632-5249 or (202) 632-5178
Between 9:00 AM - 3:00 PM

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

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

Outpatient Pharmacy Design

AA Aluminum Association Inc.
<http://www.aluminum.org>

AABC Associated Air Balance Council
<http://www.aabchg.com>

AAMA American Architectural Manufacturer's Association
<http://www.aamanet.org>

AAN American Nursery and Landscape Association
<http://www.anla.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>

AHAM Association of Home Appliance Manufacturers
<http://www.aham.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
<http://www.aitc-glulam.org>

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

ANLA American Nursery & Landscape Association
<http://www.anla.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>

ASAE American Society of Agricultural Engineers
<http://www.asae.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
<http://www.asse-plumbing.org>

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

AWI Architectural Woodwork Institute
<http://www.awinet.org>

AWS American Welding Society
<http://www.aws.org>

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

BHMA Builders Hardware Manufacturers Association
<http://www.buildershardware.com>

BIA Brick Institute of America
<http://www.bia.org>

CAGI Compressed Air and Gas Institute
<http://www.cagi.org>

CGA Compressed Gas Association, Inc.
<http://www.cganet.com>

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CI The Chlorine Institute, Inc.
<http://www.chlorineinstitute.org>

CISCA Ceilings and Interior Systems Construction Association
<http://www.cisca.org>

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

CLFMI Chain Link Fence Manufacturers Institute
<http://www.chainlinkinfo.org>

CPMB Concrete Plant Manufacturers Bureau
<http://www.cpmc.org>

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

CRSI Concrete Reinforcing Steel Institute
<http://www.crsi.org>

CTI Cooling Technology Institute
<http://www.cti.org>

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

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

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

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

ETL ETL Testing Laboratories, Inc.
<http://www.etl.com>

FAA Federal Aviation Administration
<http://www.faa.gov>

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

FPS The Forest Products Society
<http://www.forestprod.org>

GANA Glass Association of North America
<http://www.cssinfo.com/info/gana.html/>

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

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

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

HI Hydraulic Institute
<http://www.pumps.org>

HPVA Hardwood Plywood & Veneer Association
<http://www.hpva.org>

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

ICEA Insulated Cable Engineers Association Inc.
<http://www.icea.net>

\ICAC Institute of Clean Air Companies
<http://www.icac.com>

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

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

IPCEA Insulated Power Cable Engineers Association

NBMA Metal Buildings Manufacturers Association
<http://www.mbma.com>

MSS Manufacturers Standardization Society of the Valve and Fittings
Industry Inc.
<http://www.mss-hq.com>

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

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

NBS National Bureau of Standards
See - NIST

NBBPVI National Board of Boiler and Pressure Vessel Inspectors
<http://www.nationboard.org>

NEC National Electric Code
See - NFPA National Fire Protection Association

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

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

NHLA National Hardwood Lumber Association
<http://www.natlhardwood.org>

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

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

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

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

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

NWWDA Window and Door Manufacturers Association
<http://www.nwwda.org>

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

PCA Portland Cement Association
<http://www.portcement.org>

PCI Precast Prestressed Concrete Institute
<http://www.pci.org>

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

PEI Porcelain Enamel Institute, Inc.
<http://www.porcelainenamel.com>

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

RFCI The Resilient Floor Covering Institute
<http://www.rfci.com>

RIS Redwood Inspection Service
See - CRA

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

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

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

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

SJI Steel Joist Institute
<http://www.steeljoist.org>

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

SSPC The Society for Protective Coatings
<http://www.sspc.org>

STI Steel Tank Institute
<http://www.steeltank.com>

SWI Steel Window Institute
<http://www.steelwindows.com>

TCA Tile Council of America, Inc.
<http://www.tileusa.com>

TEMA Tubular Exchange Manufacturers Association
<http://www.tema.org>

TPI Truss Plate Institute, Inc.
583 D'Onofrio Drive; Suite 200
Madison, WI 53719
(608) 833-5900

UBC The Uniform Building Code
See ICBO

UL Underwriters' Laboratories Incorporated
<http://www.ul.com>

ULC Underwriters' Laboratories of Canada
<http://www.ulc.ca>

WCLIB West Coast Lumber Inspection Bureau
6980 SW Varns Road, P.O. Box 23145
Portland, OR 97223
(503) 639-0651

WRCLA Western Red Cedar Lumber Association
P.O. Box 120786
New Brighton, MN 55112
(612) 633-4334

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WWPA Western Wood Products Association
<http://www.wwpa.org>

- - - E N D - - -

SECTION 01 45 29**TESTING LABORATORY SERVICES****PART 1 - GENERAL****1.1 DESCRIPTION:**

A. This section specifies materials testing activities and inspection services required during project construction to be provided by a Testing Laboratory retained and paid for by 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):

1. T27-06 Sieve Analysis of Fine and Coarse Aggregates
2. T96-02 (R2006) Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
3. T99-01 (R2004) The Moisture-Density Relations of Soils Using a 2.5 Kg (5.5 lb.) Rammer and a 305 mm (12 in.) Drop
4. T104-99 (R2003) Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
5. T180-01 (R2004) Moisture-Density Relations of Soils using a 4.54 kg (10 lb.) Rammer and a 457 mm (18 in.) Drop
6. T191-02(R2006) Density of Soil In-Place by the Sand-Cone Method

C. American Concrete Institute (ACI):

1. (R2004) Guide for the Evaluation of Shotcrete

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

1. A325-06 Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
2. A370-07 Definitions for Mechanical Testing of Steel Products
3. A416/A416M-06 Steel Strand, Uncoated Seven-Wire for Prestressed Concrete
4. A490-06 Heat Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength
5. C31/C31M-06 Making and Curing Concrete Test Specimens in the Field
- 6.
7. C33-03 Concrete Aggregates

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8. C39/C39M-05 Compressive Strength of Cylindrical Concrete Specimens
9. C109/C109M-05 Compressive Strength of Hydraulic Cement Mortars
10. C138-07 Unit Weight, Yield, and Air Content (Gravimetric) of Concrete
11. C140-07 Sampling and Testing Concrete Masonry Units and Related Units
12. C143/C143M-05 Slump of Hydraulic Cement Concrete
13. C172-07 Sampling Freshly Mixed Concrete
14. C173-07 Air Content of freshly Mixed Concrete by the Volumetric Method
15. C330-05 Lightweight Aggregates for Structural Concrete
16. C567-05 Density Structural Lightweight Concrete
17. C780-07 Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
18. C1019-08 Sampling and Testing Grout
19. C1064/C1064M-05 Freshly Mixed Portland Cement Concrete
20. C1077-06 Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
21. C1314-07 Compressive Strength of Masonry Prisms
22. D698-07 Laboratory Compaction Characteristics of Soil Using Standard Effort
23. D1143-07 Piles Under Static Axial Compressive Load
24. D1188-07 Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Paraffin-Coated Specimens
25. D1556-07 Density and Unit Weight of Soil in Place by the Sand-Cone Method
26. D1557-07 Laboratory Compaction Characteristics of Soil Using Modified Effort
27. D2166-06 Unconfined Compressive Strength of Cohesive Soil
28. D2167-94(R2001) Density and Unit Weight of Soil in Place by the Rubber Balloon Method
29. D2216-05 Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
30. D2922-05 Density of soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
31. D2974-07 Moisture, Ash, and Organic Matter of Peat and Other Organic Soils
32. D3666-(2002) Minimum Requirements for Agencies Testing and Inspection Bituminous Paving Materials
33. D3740-07 Minimum Requirements for Agencies Engaged in the Testing and Inspecting Road and Paving Material

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- 34. E94-04 Radiographic Testing
- 35. E164-03 Ultrasonic Contact Examination of Weldments
- 36. E329-07 Agencies Engaged in Construction Inspection and/or Testing
- 37. E543-06 Agencies Performing Non-Destructive Testing
- 38. E605-93(R2006) Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
- 39. E709-(2001) Guide for Magnetic Particle Examination
- 40. E1155-96(R2008) Determining FF Floor Flatness and FL Floor Levelness Numbers

E. American Welding Society (AWS):

- 1. Structural Welding Code-Steel
- 2. D1.8/D1.8M-05 Structural Welding Code - Seismic Supplement

F. American institute of Steel Construction (AISC):

- 1. 341-05 Seismic Provisions for Structural Steel Buildings, Including Supplement No. 1.

1.3 REQUIREMENTS:

A. Accreditation Requirements:

- 1. Testing Laboratory retained and paid for by Contractor, must be accredited by one or more of the National Voluntary Laboratory Accreditation Program (NVLAP) programs acceptable in the geographic region for the project. Furnish to the Contracting Officer's Representative a copy of the Certificate of Accreditation and Scope of Accreditation. For testing laboratories that have not yet obtained accreditation by a NVLAP program, submit an acknowledgement letter from one of the laboratory accreditation authorities indicating that the application for accreditation has been received and the accreditation process has started, and submit to the Contracting Officer's Representative for approval, certified statements, signed by an official of the testing laboratory attesting that the proposed laboratory, meets or conforms to the ASTM standards listed below as appropriate to Laboratories engaged in non-destructive testing (NDT) shall meet the Laboratories engaged in testing of construction materials shall meet the requirements of ASTM E329.
- 2. Testing Laboratory shall send reports to both COR and Contractor. Reports shall be available within 24 hours.
- 3. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
- 4. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D3666.
- 5. Laboratories engaged in testing of soil and rock, as used in engineering design and construction, shall meet the requirements of ASTM D3740.

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6. Laboratories engaged in inspection and testing of steel, stainless steel, and related alloys will be evaluated according to ASTM A880. For Seismic Load Resisting System (SLRS) Inspectors shall be provided as required by Appendix W, Section W3 of AISC 341.
7. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543 and Appendix W, Section W3 of AISC 341.
8. Laboratories engaged in Hazardous Materials Testing shall meet the requirements of OSHA and EPA.

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, and Local Building Authority within 24 hours after each test is completed 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 Additional inspections and/or testing not listed but typically required by general industry, product manufacturer, or recommended by testing lab as general practice shall be done in order to meet quality standards commonly encountered in construction.

3.2 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 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

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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 m³ (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 m³ (25 cubic yards) thereafter each for concrete not required to be air-entrained, test every 80 m³ (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

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- 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. Water shall not be added except as approved by QC or Lab technician verification of amount not exceeded as shown on batch ticket.
 - b. Observe minimum and maximum mixing times.
- 18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements FF and FL 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. Wedge and Adhesive anchor installations.
- C. Laboratory Tests of Field Samples:
 - 1. Test compression test cylinders for strength in accordance with ASTM

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C39. A minimum of three cylinders shall be taken for each test series. 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/m³ (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.

3.3 REINFORCEMENT:

- A. Review mill test reports furnished by Contractor.
- B. Perform sampling at fabricating plant. Take two samples from each 23 t (25 tons) or fraction thereof of each size of reinforcing steel No. 10 thru No. 57 (No. 3 thru No. 18).
- C. Make one tensile and one bend test in accordance with ASTM A370 from each pair of samples obtained.
- D. Written report shall include, in addition to test results, heat number, manufacturer, type and grade of steel, and bar size.
- E. Perform tension tests of mechanical and welded splices in accordance with ASTM A370.

3.4 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 Structural Welding Code. For the Seismic Load Resisting System (SLRS), additional inspection and testing requirements are to be performed as required in AWS 1.8 Structural Welding Code - Seismic

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Supplement and AISC 341 - Seismic Provisions, and these provisions.

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.
6. For members of the SLRS, provide additional testing, inspection and documentation requirements for both welding and bolting as noted in AISC 341 for the Quality Assurance (QA) activity as required by Section Q5 through Q5.4.

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.

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- i. Verify that correction of rejected welds are made in accordance with D1.1.
 - j. Testing and inspection do not relieve the Contractor of the responsibility Testing and inspection do not relieve the Contractor of the responsibility specified requirements.
2. Bolt Inspection:
 - a. Inspect high-strength bolted connections in accordance AISC Specifications for Structural Joints Using ASTM A325 or A490 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 A325 or A490 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 A325 or A490 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.
3. For members of the SLRS provide additional testing, inspection and documentation requirements for both welding and bolting as specified in AISC 341 for the Quality Assurance (QA) tasks and documentation as required by Section Q5 through Q5.4, and W4.1 and 4.2, and Sections W6.2 and W6.3 of AISC 341-05 for Demand Critical Welds.

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

3.5 SHEAR CONNECTOR STUDS:

A. Provide field inspection and testing services required by AWS D.1 to insure shear connector studs have been installed in accordance with contract documents.

B. Tests: Test 20 percent of headed studs for fastening strength in accordance with AWS D1.1.

C. Submit inspection reports, certification, and instances of noncompliance to Contracting Officer's Representative.

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3.6 SPRAYED-ON FIREPROOFING:

- A. Provide field inspection and testing services to certify sprayed-on fireproofing has been applied in accordance with contract documents.
- B. Obtain a copy of approved submittals from Contracting Officer's Representative.
- C. Use approved installation in test areas as criteria for inspection of work.
- D. Test sprayed-on fireproofing for thickness and density in accordance with ASTM E605.
1. Thickness gauge specified in ASTM E605 may be modified for pole extension so that overhead sprayed material can be reached from floor.
- E. Location of test areas for field tests as follows:
1. Thickness: Select one bay per floor, or one bay for each 930 m² (10,000 square feet) of floor area, whichever provides for greater number of tests. Take thickness determinations from each of following locations: Metal deck, beam, and column.
 2. Density: Take density determinations from each floor, or one test from each 930m² (10,000 square feet) of floor area, whichever provides for greater number of tests, from each of the following areas: Underside of metal deck, beam flanges, and beam web.
- F. Submit inspection reports, certification, and instances of noncompliance to Contracting Officer's Representative.

3.7 TYPE OF TEST:

Approximate Number
of Tests Required

A. Concrete:

Making and Curing Concrete Test Cylinders (ASTM C31)	__30__
Compressive Strength, Test Cylinders (ASTM C39)	__30__
Concrete Slump Test (ASTM C143)	__12__
Concrete Air Content Test (ASTM C173)	__4__
Unit Weight, Lightweight Concrete (ASTM C567)	__4__
Aggregate, Normal Weight:	
Gradation (ASTM C33)	__3__
Deleterious Substances (ASTM C33)	__3__
Soundness (ASTM C33)	__3__
Abrasion (ASTM C33)	__3__
Aggregate, Lightweight	
Gradation (ASTM C330)	__1__
Deleterious Substances (ASTM C330)	__1__
Unit Weight (ASTM C330)	__1__
Flatness and Levelness Readings (ASTM E1155) (number of days)	__2__

B. Reinforcing Steel:

Tensile Test (ASTM A370)	__2__
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|----|--|----------|
| | Bend Test (ASTM A370) | ___2___ |
| | Mechanical Splice (ASTM A370) | ___1___ |
| | Welded Splice Test (ASTM A370) | ___1___ |
| | Masonry Unit, Compressive Strength (ASTM C140) | _____ |
| | Prism Tests (ASTM C1314) | _____ |
| C. | Structural Steel: | |
| | Ultrasonic Testing of Welds (ASTM E164) | ___10___ |
| | Magnetic Particle Testing of Welds (ASTM E709) | ___30___ |
| | Radiographic Testing of Welds (ASTM E94) | ___4___ |
| | Shear Connectors | ___20___ |
| D. | Sprayed-On Fireproofing: | |
| | Thickness and Density Tests (ASTM E605) | ___20___ |
| E. | Inspection: | |
| | Technical Personnel (Man Days) | as req'd |
| F. | Technical Personnel: (Minimum _____ months) | |
| 1. | Technicians to perform tests and inspection listed above. Laboratory will be equipped with concrete cylinder storage facilities, compression machine, cube molds, proctor molds, balances, scales, moisture ovens, slump cones, air meter, and all necessary equipment for compaction control. | |

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SECTION 01 57 19**TEMPORARY ENVIRONMENTAL CONTROLS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the control of environmental pollution and damage that the Contractor must consider for air, water, and land resources. It includes management of visual aesthetics, noise, solid waste, radiant energy, and radioactive materials, as well as other pollutants and resources encountered or generated by the Contractor. The Contractor is obligated to consider specified control measures with the costs included within the various contract items of work.
- B. Environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which:
1. Adversely affect 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.

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- 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):
 - 1. 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 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's Representative 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.

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

1.5 PROTECTION OF ENVIRONMENTAL RESOURCES

- A. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this contract. Confine activities to areas defined by the specifications and drawings.
- B. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
- 1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 - 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 - 3. Monitor water areas affected by construction.
- C. Protection of Fish and Wildlife Resources: Keep construction activities under surveillance, management, and control to minimize interference with, disturbance of, or damage to fish and wildlife. Prior to beginning construction operations, list species that require specific attention along with measures for their protection.

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D. 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 California and Bay Area Air Quality Management District (BAAQMD) 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.

E. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer's Representative. Maintain noise-produced work at or below the decibel levels and within the time periods specified.

1. Perform construction activities involving repetitive, high-level impact noise only between 7:30 a.m. and 4:00 p.m. unless otherwise permitted by local ordinance or the Contracting Officer's Representative. Repetitive impact noise on the property shall not exceed the following dB limitations:

Time Duration of Impact Noise	Sound Level in dB
More than 12 minutes in any hour	70
Less than 30 seconds of any hour	85
Less than three minutes of any hour	80
Less than 12 minutes of any hour	75

2. Provide sound-deadening devices on equipment and take noise abatement measures that are necessary to comply with the requirements of this contract, consisting of, but not limited to, the following:
 - a. Maintain maximum permissible construction equipment noise levels at 15 m (50 feet) (dBA):

EARTHMOVING		MATERIALS HANDLING	
FRONT LOADERS	75	CONCRETE MIXERS	75
BACKHOES	75	CONCRETE PUMPS	75
DOZERS	75	CRANES	75

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TRACTORS	75	DERRICKS IMPACT	75
SCAPERS	80	PILE DRIVERS	95
GRADERS	75	JACK HAMMERS	75
TRUCKS	75	ROCK DRILLS	80
PAVERS,	80	PNEUMATIC TOOLS	80
STATIONARY			
PUMPS	75	BLASTING	--
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 Contracting Officer's Representative noting any problems and the alternatives for mitigating actions.
- F. 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.
- G. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Contracting Officer's Representative. Cleaning shall include off the station disposal of all items and materials not required to be salvaged, as well as all debris and rubbish resulting from demolition and new work operations.

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SECTION 01 58 16**TEMPORARY INTERIOR SIGNAGE****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. 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 150mm (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.

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4. Communicating doors in partitions between rooms with corridor entrance doors.
 5. Closet doors within rooms.
- C. Replace missing, damaged, or illegible signs.

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SECTION 01 74 19**CONSTRUCTION WASTE MANAGEMENT****PART 1 - GENERAL****1.1 DESCRIPTION**

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

1.2 RELATED WORK

- A. Section 02 41 00, DEMOLITION.

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B. Section 01 00 00, GENERAL REQUIREMENTS.

1.3 QUALITY ASSURANCE

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

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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.

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- 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 Contracting Officer's Representative a written demolition debris management plan. The plan shall include, but not be limited to, the following information:
 - 1. Procedures to be used for debris management.
 - 2. Techniques to be used to minimize waste generation.
 - 3. Analysis of the estimated job site waste to be generated:
 - a. List of each material and quantity to be salvaged, reused, recycled.
 - b. List of each material and quantity proposed to be taken to a landfill.
 - 4. Detailed description of the Means/Methods to be used for material handling.
 - a. On site: Material separation, storage, protection where applicable.
 - b. Off site: Transportation means and destination. Include list of materials.
 - 1) Description of materials to be site-separated and self-hauled to designated facilities.
 - 2) Description of mixed materials to be collected by designated waste haulers and removed from the site.

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- c. The names and locations of mixed debris reuse and recycling facilities or sites.
 - d. The names and locations of trash disposal landfill facilities or sites.
 - e. Documentation that the facilities or sites are approved to receive the materials.
- C. Designated Manager responsible for instructing personnel, supervising, documenting and administer over meetings relevant to the Waste Management Plan.
- D. Monthly summary of construction and demolition debris diversion and disposal, quantifying all materials generated at the work site and disposed of or diverted from disposal through recycling.

1.6 APPLICABLE PUBLICATIONS

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

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. Records shall be kept in accordance with the LEED Reference Guide and LEED Template.

PART 2 - PRODUCTS**2.1 MATERIALS**

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

PART 3 - EXECUTION**3.1 COLLECTION**

- A. Provide all necessary containers, bins and storage areas to facilitate effective waste management. Bins shall only be stored on site on an as-needed basis for disposal and transference to landfill. Please submit expected timeline for initial project demolition phase for bin to be

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stationed on site for approval. Afterwards expected timeline for dumpster on site is one week maximum for disposal and haul to landfill. All time periods and dumpster arrival/removal must be coordinated with COR beforehand in writing. Provide 14 working day notice unless otherwise noted.

- 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. Submit qualification of all waste disposal facilities or transfer stations used. Provide disposal tickets for individual trucks along with daily reports. All items within the project must be tracked cradle-to-grave and submitted to COR.

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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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 21, Division 23 and Division 28 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 21, Division 23 and Division 28 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 contract 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.
- G. The intent of this section is for the Contractor and Commissioning entity to sufficiently satisfy the VA's requirement that all systems listed in the Commissioning sections of the various MEP divisions function as indicated on the drawings and as designed, and to meet the performance requirements indicated in the Contract Documents.

1.2 CONTRACTUAL RELATIONSHIPS

- A. For this construction project, the Department of Veterans Affairs will select a commissioning agent from a list proposed and paid for by the Contractor. At the VA's discretion, the commissioning agent may be an employee of the contractor.
1. Commissioning Issues identified by the Commissioning Agent will be delivered to the Contracting Officer's Representative 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 Contracting Officer's Representative to require either an official interpretation of the construction documents or require a modification of the contract documents, the Contracting Officer or Contracting Officer's Representative will issue an official directive to this effect.
4. All parties to the Commissioning Process shall be individually responsible for alerting the Contracting Officer's Representative 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 Contracting Officer's Representative, 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 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES
- C. Section 21 08 00 COMMISSIONING OF FIRE PROTECTION SYSTEMS.
- D. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- E. 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.

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

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List of Acronyms	
Acronym	Meaning
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
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-COR	VA Contracting Officer's Representative
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, but only to the extent affected by this project:

Systems To Be Commissioned	
System	Description
Fire Suppression	
Fire Sprinkler Systems	Wet pipe system, dry pipe system, pre-action system, special agent systems
Plumbing	
Domestic Water Distribution	Booster pumps, backflow preventers, water softeners, potable water storage tanks
Domestic Hot Water Systems	Water heaters**, heat exchangers, circulation pumps, point-of-use water heaters*
Medical Air Systems	Packaged medical air compressor units. Outlet certification, cross-connection verification
Medical Vacuum Systems	Packaged medical vacuum units, outlet certification, cross-connection verification
Medical Gas Systems (other than Medical Air Systems)	Medical gas (oxygen, nitrogen, nitrous oxide, etc.) tank/manifold systems, outlet certification, cross-connection verification
HVAC	
Noise and Vibration Control	Noise and vibration levels for critical equipment such as Air Handlers, Chillers, Cooling Towers, Boilers, Generators, etc. will be commissioned as part of the system commissioning

Systems To Be Commissioned	
System	Description
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, packaged rooftop AHU, Outdoor Air conditioning units, humidifiers, DDC control panels
HVAC Ventilation/Exhaust Systems	General exhaust, toilet exhaust, laboratory exhaust, isolation exhaust, room pressurization control systems
HVAC Terminal Unit Systems	VAV Terminal Units, CAV terminal units, fan coil units, fin-tube radiation, unit heaters
Electrical	
Medium-Voltage Electrical Distribution Systems	Medium-Voltage Switchgear, Medium-Voltage Switches, Underground ductbank and distribution, Pad-Mount Transformers, Medium-Voltage Load Interrupter Switches,
Grounding & Bonding Systems	Witness 3rd party testing, review reports
Electrical System Protective Device Study	Review reports, verify field settings consistent with Study
Secondary Unit Substations	Medium-voltage components, transformers, low-voltage distribution, verify breaker testing results (injection current, etc)
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)

Outpatient Pharmacy Design

Systems To Be Commissioned	
System	Description
Lighting & Lighting Control Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, exterior lighting and controls
Communications	
Grounding & Bonding System	Witness 3rd party testing, review reports
Structured Cabling System	Witness 3rd party testing, review reports
Master Antenna Television System	Witness 3rd party testing, review reports
Public Address & Mass Notification Systems	Witness 3rd party testing, review reports
Intercom & Program Systems	Witness 3rd party testing, review reports
Nurse Call & Code Blue Systems	Witness 3rd party testing, review reports
Security Emergency Call 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
Physical Access Control Systems	Witness 3rd party testing, review reports
Access Control Systems	Witness 3rd party testing, review reports
Security Access Detection Systems	Witness 3rd party testing, review reports
Video Surveillance 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.

1.8 COMMISSIONING TEAM

- A. The commissioning team shall consist of, but not be limited to, representatives of Contractor 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.
- 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 select the CxA under from a list provided and paid for by the Contractor.
 - 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. Attend:
 - 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. Participate in meetings to coordinate Systems Functional Performance Testing.
6. Provide schedule for operation and maintenance data submittals, equipment startup, and testing to Commissioning Agent for incorporation into the commissioning plan.
7. Provide information to the Commissioning Agent for developing commissioning plan.
8. Participate in training sessions for VA's operation and maintenance personnel.
9. 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.
- 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.

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- 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.

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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 a 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.

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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
- H. 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.

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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.

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- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA Contracting Officer's Representative 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 45 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 45 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 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.

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- 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.

3.2 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.

3.3 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.

3.4 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 Contracting Officer's Representative 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 Contracting Officer's

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- Representative. Any pre-test trend analysis comments generated by the Commissioning Team should be addressed and resolved by the Contractor, as directed by the Contracting Officer's Representative, 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.

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 Contracting Officer's Representative 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.
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.

3.5 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.

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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.

3.6 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

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- 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.

3.7 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.

3.8 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 Contracting Officer's Representative, 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 Division 21, Division 22, Division 23, Division 26, Division 27 and Division 28 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: Provide training 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. Medical equipment, including medical gas equipment and piping.
 - e. Heat generation, feedwater equipment, pumps, steam distribution piping, condensate return systems, heating hot water heat exchangers, and heating hot water distribution piping.
 - f. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.
 - g. HVAC systems, including air handling equipment, air distribution systems, and terminal equipment and devices.
 - h. HVAC instrumentation and controls.
 - i. Electrical service and distribution, including switchgear, transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.
 - j. Lighting equipment and controls.
 - k. Communication systems, including intercommunication, surveillance, nurse call systems, public address, mass evacuation, voice and data, and entertainment television

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SECTION 02 41 00**DEMOLITION****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies demolition and removal of portions of buildings, utilities, other structures and debris.

1.2 RELATED WORK:

- A. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT: Procedures and requirements for managing and disposing construction and demolition waste.
- A. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- E. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- F. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

1.3 PROTECTION:

- A. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures. Comply with requirements of GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations. Comply with requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES AND IMPROVEMENTS. Along with other safeguards, provide ONLY ONE route through facility and transfer all waste in covered bins as approved by Infection Control Representative. Coordinate with COR and IC Representative at development of ICRA and project walkthrough phase, and follow-up before demolition phase is conducted to ensure requirements are being met. COR will approve and designate route. All accessible routes, disposal routes, etc. will

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be sent to Public Affairs to disseminate to all building/campus personnel to take head of changes.

- 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; 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 or work area.
 - 2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 3. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the 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's approval.
- H. The work shall comply with the requirements of Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- I. The work shall comply with the requirements of Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7 INFECTION PREVENTION MEASURES.

1.4 UTILITY SERVICES:

- A. Demolish and remove outside utility service lines shown to be removed.

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- B. Remove abandoned outside utility lines that would interfere with installation of new utility lines and new construction.
- C. Take all measures necessary to maintain all utility services to the building, which will remain occupied during work within the Pharmacy area.

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. Remove all items that will not be in use as a result of new work and document extent of removal on as-builts.
- 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. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. Remove and legally dispose of all materials, except that shown to remain as part of project work. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- D. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer'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:

- A. 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.

3.3 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

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- B.** To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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PART 1 - GENERAL**1.1 SUMMARY OF THE WORK****1.1.1 CONTRACT DOCUMENTS AND RELATED REQUIREMENTS:**

Drawings, general provisions of the contract, including general and supplementary conditions, Asbestos Abatement, Demolition, Accident Prevention (FAR 52.236-13) and other Division 01, GENERAL REQUIREMENTS specifications, shall apply to the work of this section. Prevailing wage requirements pursuant to the Davis-Bacon Act shall apply to this work. The contract documents show 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, coordination with other work and the phasing of the work. In the event the 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 Abatement Contractor without obtaining guidance from the Contracting Officer shall become the sole risk and responsibility of the Abatement Contractor.

1.1.2 EXTENT OF WORK:

- A. This work will be asbestos abatement prior to the total demolition of the facility as indicated by the scope of work. RACM discovered during total demolition is also within the scope of this specification. The extent of the abatement is for informational purposes only and is based on the best information available at the time of the specification preparation. The Abatement Contractor shall satisfy themselves as to the extent of the work. Nothing in this section may be interpreted as limiting the extent of work otherwise required by this contract and related documents.

1.1.3 SCOPE OF WORK:

- A. Scope of work will be as identified in and based on A.C.C Environmental Consultant's report's titled:

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- ASBESTOS SURVEY REPORT Building No. 002, Department of Veterans Affairs Medical Center, 4150 Clement Street, San Francisco, California (Dated: June 27, 1997) and
- : ASBESTOS SURVEY REPORT Building No. 200, Department of Veterans Affairs Medical Center, 4150 Clement Street, San Francisco, California (Dated: June 27, 1997)

B. Removal, clean-up and disposal of regulated asbestos containing materials (RACM) and asbestos contaminated elements shall be conducted in approved regulated areas in all areas prior to the beginning of demolition. Any RACM discovered during demolition activity shall be cause for stopping the work. The Demolition Contractor's personnel shall attend an on-site training session related to the types of asbestos at the site and shall not disturb the ACM if found during their work. No abatement work shall begin in any area unless the Abatement Contractor/Competent Person/VA Representative agreed that all asbestos work requirements as stipulated in the specification have been met. Attachment #4 must be filled out for each abatement area.

1.1.4 RELATED WORK:

A. Section 02 82 13.41, ASBESTOS ABATEMENT FOR TOTAL DEMOLITION PROJECTS.

1.1.5 TASKS:

The work tasks are summarized briefly as follows:

- A. Asbestos abatement of RACM as required by EPA NESHAP's prior to demolition. An EPA/State certified Project Designer must provide a site-specific specification for the asbestos abatement.
- B. Asbestos abatement and clean-up of the asbestos containing debris as indicated in the scope of work. Pre-abatement activities including pre-abatement meeting(s), inspection(s), notifications, permits, submittal approvals, work-site preparation/isolation, accident prevention, emergency procedures arrangements, and standard operating procedures for asbestos abatement work.
- C. Demolition activities including demolition, clean-up and disposal of building materials, record keeping, security, monitoring, and inspections conducted in accordance with all applicable laws and this

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specification. A Demolition Plan, developed by a Professional Engineer, meeting the requirements of 29 CFR 1926.850(a) must be provided.

1.1.6 ABATEMENT CONTRACTOR USE OF PREMISES:

- A. The Abatement Contractor and Contractor's personnel shall cooperate fully with the VA representative/consultant to facilitate efficient use of buildings and areas within buildings. The Abatement Contractor shall perform the work in accordance with the VA specifications and in compliance with any/all applicable Federal, State and Local regulations and requirements.
- B. The Abatement Contractor shall use the existing facilities in the building within the limits indicated in contract documents as well as the specifications for the project. Any variation shall be secured in writing from the VA representative through the pre-abatement plan of action.

1.2 STOP ABATEMENT ORDER:

- A. If the Contracting Officer Technical Representative (COTR) or VPIH presents a written Stop Abatement Work Order, the Abatement Contractor/Personnel shall immediately stop all abatement work. The Abatement Contractor shall not resume any abatement activity until authorized to do so by the COTR/VPIH. A stop abatement work order may be issued at any time the VA determines abatement conditions/activities are not within specification requirements. Work stoppage will continue until conditions have been corrected to the satisfaction of the VA.
- B. Standby time and costs for corrective actions will be borne by the Abatement Contractor.
- C. The occurrence of any of the following events shall be reported immediately by the Abatement Contractor in writing to the VA representative and shall require the Contractor to immediately stop abatement activities:
 - 1. discovery of friable asbestos;
 - 2. non-friable asbestos rendered friable;
 - 3. serious injury or death;
 - 4. fire/safety emergency;
- D. Violations of local, state and/or federal environmental or occupational regulations shall be reported immediately by the Abatement Contractor in writing to the VA representative. The VA representative shall stop work,

as appropriate. The Abatement Contractor shall not commence work again until instructed to proceed by the VA representative.

1.3 DEFINITIONS:

1.3.1 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.

1.3.2 GLOSSARY:

Abatement - Procedures to control fiber release from asbestos-containing materials, typically during removal. Includes removal, encapsulation, enclosure, and renovation activities related to asbestos.

ACE - Asbestos contaminated elements in excess of 1%.

ACM - Asbestos containing material in excess of 1%.

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.

Aggressive method - Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact ACM.

Aggressive 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. Regulations implementing this statute were 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 2 is used to determine the fiber levels in air.

Air sample filter - The filter used to collect fibers that are then counted. The filter is made of mixed cellulose ester membrane for PCM

(Phase Contrast Microscopy) and polycarbonate for TEM (Transmission Electron Microscopy)

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-containing material (ACM) - Any material containing more than one percent asbestos.

Asbestos contaminated elements (ACE) - Building elements such as ceilings, walls, lights, or ductwork that are contaminated with asbestos.

Asbestos-containing waste material - Asbestos-containing material or asbestos contaminated objects requiring disposal.

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.

ASHARA - Asbestos School Hazard Abatement Reauthorization Act. Provided for the accreditation of personnel performing asbestos work in public and commercial buildings.

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 having jurisdiction over the regulated area.

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 plastic sheeting secured in place at openings such as doors, windows, or any other opening into the regulated area.

Primary Barrier - Barriers placed over critical barriers and exposed directly to abatement work.

Secondary Barrier - Any additional sheeting 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.

Building/facility owner - The legal entity, including a lessee, which exercises control over management and record keeping 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) - One certified in practice of industrial hygiene by the American Board of Industrial Hygiene. An industrial hygienist Certified in Comprehensive Practice 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/Change 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 CPIH with confirmation clearance performed by the VPIH.

May not be required for a total demolition project since personnel will not return to the building.

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

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meets the criteria of EPA's Model Accreditation Plan (40 CFR 763) for supervisor.

Contracting Officer's Technical Representative (COTR) - VA

representative responsible for the on-going project work, typically the Resident Engineer (RE).

Contractor's Professional Industrial Hygienist (CPIH) - The asbestos abatement contractor's industrial hygienist. The industrial hygienist must meet the qualification requirements of the Professional IH.

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 - EPA NESHAP's - The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

Demolition - VA Total - means a building or substantial part of a building is completely removed, torn or knocked down, bulldozed, flattened, or razed, including removal of building debris.

Disposal bag - Typically 6 mil thick siftproof, dustproof, leaktight 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 - Activities 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.

Employee exposure - The exposure to airborne asbestos that would occur if the employee were not wearing respiratory protection equipment.

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/waste decontamination facility (EWDF) - The area in which equipment is decontaminated before removal from the regulated area.

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 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.

Friable asbestos containing material - Any material containing more than 1 percent asbestos as determined using the method specified in appendix A, Subpart F, 40 CFR 763, section 1, 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 - A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 microns or greater 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 - AIHA - An Industrial Hygienist is a person having a college or university degree or degrees in engineering, physics, or medicine or related biological sciences who, by virtue of special studies and training, has acquired competence in industrial hygiene. Such special studies and training must have been sufficient in all of the above cognate sciences to provide the abilities: (1) to recognize the environmental factors and stresses associated with work and work operations and to understand their effect on humans and their well being; (2) to evaluate, on the basis of experience and with the aid of quantitative measurement techniques, the magnitude of these stresses in terms of ability to impair human health and well being; and (3) to

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prescribe methods to eliminate, control or reduce such stresses when necessary to alleviate their effects.(AIHA).

Industrial hygienist 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.

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.

National Emission Standards for Hazardous Air Pollutants (NESHAP's) - EPA's rule to control emissions of hazardous air pollutants to the environment. Asbestos is defined in NESHAP's as a hazardous air pollutant.

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's.

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" water 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 outside the respirator.

Non-friable ACM - Material that contains more than 1 percent asbestos but cannot be crumbled, pulverized, or reduced to powder by hand pressure.

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.

Personal sampling/monitoring - Representative air samples obtained in the breathing zone of the person using a cassette and battery operated pump to determine asbestos exposure.

Permissible exposure limit (PEL) - The level of exposure OSHA allows for an 8 hour time weighted average. For asbestos fibers, the PEL is 0.1 fibers per cc.

Polarized light microscopy (PLM) - Light microscopy using dispersion staining techniques and refractive indices to identify and quantify the type(s) of asbestos present in a bulk sample.

Polyethylene sheeting - Strong plastic barrier material 4 to 6 mils thick, semi-transparent, sometimes flame retardant in compliance with NFPA 241.

Positive/negative fit check - A method of verifying the fit of a respirator by closing off the filters and breathing in or closing off the exhalation valve and breathing out while detecting leakage of the respirator.

Presumed ACM (PACM) - Means presumed asbestos containing material.

Professional IH - An IH who meets the definition requirements of AIHA; meets the definition requirements of OSHA as a "Certified Asbestos Consultant" at 8 CCR 1529(q); 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.

Project designer - A person who has successfully completed the training requirements for an asbestos abatement project designer as required by 40 CFR 763 Appendix C, Part I; (B)(5).

Protection factor - A value assigned by OSHA/NIOSH to indicate the assigned protection a respirator should provide if worn properly. The number indicates the reduction of exposure level from outside to inside the respirator.

Qualitative fit test (QLFT) - A fit test using a challenge material that can be sensed by the wearer if leakage in the respirator occurs.

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 an 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 nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been

subjected to sanding, grinding, cutting, or abrading or; Category II nonfriable 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.

Shower room - The portion of the PDF where personnel shower before leaving the regulated area. Also used for bag/drum decontamination in the EWDF.

Standard operating procedures (SOP's) - Asbestos work procedures incorporating and meeting regulatory requirements to be submitted by the abatement contractor before work begins.

Surfacing ACM - A material containing more than 1 percent asbestos that is sprayed, troweled on or otherwise applied to surfaces for acoustical, 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.

VA Professional Industrial Hygienist (VPIH) - Department of Veterans Affairs Professional Industrial Hygienist. Must meet the definition of Professional IH.

VA Representative - The VA official responsible for on-going project work.

Visible emissions - Any emissions, which are visually detectable without the aid of instruments, coming from ACM/PACM/RACM or ACM waste material.

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.

1.3.3 REFERENCED STANDARDS ORGANIZATIONS:

The following acronyms or abbreviations as referenced in contract/specification documents are defined to mean the associated names. Names and addresses may be subject to change.

- A. VA Department of Veterans Affairs
810 Vermont Avenue, NW
Washington, DC 20420
- B. CFR Code of Federal Regulations
Government Printing Office
Washington, DC 20420
- C. EPA Environmental Protection Agency
401 M St., SW
Washington, DC 20460
202-382-3949
- D. MIL-STD Military Standards/Standardization Division
Office of the Assistant Secretary of Defense
Washington, DC 20420
- E. NEC National Electrical Code (by NFPA)
- F. NEMA National Electrical Manufacturer's Association
2101 L Street, N.W.
Washington, DC 20037
- G. NFPA National Fire Protection Association
1 Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
800-344-3555
- H. OSHA Occupational Safety and Health Administration
U.S. Department of Labor
Government Printing Office
Washington, DC 20402
- I. DOT Department of Transportation
Washington, DC 20590.

1.4 APPLICABLE CODES AND REGULATIONS**1.4.1 GENERAL APPLICABILITY OF CODES, REGULATIONS, AND STANDARDS:**

- A. All work under this contract shall be done in strict accordance with all applicable Federal, State, and local regulations, standards and codes

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governing asbestos abatement. All applicable codes, regulations and standards are adopted into this specification and will have the same force and effect as this specification. States may have requirements that exempt Federal facilities from compliance with State regulations, contractors performing asbestos related work at VA facilities shall comply with State requirements, including licensing and accreditation.

- B. The most recent edition of any relevant regulation, standard, document or code shall be in effect. Where conflict among the requirements or with these specification exists, the most stringent requirement(s) shall be utilized.
- C. 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 Abatement Contractor's office area/clean room.

1.4.2 ABATEMENT CONTRACTOR RESPONSIBILITY:

The Abatement 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 abatement project. The contractor is responsible for providing and maintaining training and personal protective equipment as required by applicable Federal, State and Local regulations. The Abatement Contractor shall hold the VA harmless for any failure of the Contractor to comply with any applicable abatement work, transporting, disposal, safety, health and environmental regulation/requirement on the part of himself, his employees, or his subcontractors. In the event of non-friable asbestos disturbance, the Abatement Contractor will incur all costs of the VPIH, including all corrective abatement, sampling/analytical, and disposal costs to assure compliance with OSHA/EPA/State requirements.

1.4.3 FEDERAL REQUIREMENTS:

Federal requirements which govern various aspects of asbestos abatement include, but are not limited to, the following regulations:

- A. Occupational Safety and Health Administration (OSHA)
 - 1. Title 29 CFR 1926 - Construction Standard Requirements - Demolition Work
 - 2. Title 29 CFR 1910.38(a);(b) - Emergency Action Plan
 - 3. Title 29 CFR 1910.132 - Personal Protective Equipment

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4. Title 29 CFR 1910.20 - Access to Employee Exposure and Medical Records
5. Title 29 CFR 1910.1200 - Hazard Communication
6. Title 29 CFR 1910.151 - Medical and First Aid
- B. Environmental Protection Agency (EPA)
 1. Title 40 CFR 61 Subpart A and M (Revised Subpart B) - National Emission Standard for Hazardous Air Pollutants - Asbestos.
 2. Title 40 CFR 763 - Asbestos Hazard Emergency Response Act (AHERA) and Asbestos School Hazard Abatement Reauthorization Act (ASHARA).

1.4.4 STATE REQUIREMENTS:

State requirements that apply to the abatement work include, but are not limited to, the following:

- A. State of California
 - Assembly Bill (AB) 2040 - Yearly Registration of CONTRACTORS.
 - California Proposition 65.
- B. California Department of Industrial Relations, Division of Occupational Safety and Health (DOSH), Title 8, California Administrative Code:
 - Asbestos Standard 1529 and 5208.
 - Confined Space Entry - General Industry Safety Orders (Chapter 4, Subchapter 7, Article 108, Sections 5157 and 5158).
 - Carcinogen Regulation 5209.
 - Carcinogen and Asbestos Registration Sections 340-344.53, 341.6 amended and 341.9 amended through 341.14.
 - Respiratory Protection Equipment Standard 5144.
 - Hazard Communications Standard 5194.
 - Accident Prevention Program 3203.
 - Access to Employee Exposure and Medical Records 3204.
 - Accident Prevention Signs 6003.
 - Emergency Action Plan 3220.
 - Fire Prevention Plan 3221.
 - Electrical Safety Orders, Chapter 4, Subchapter 5.
 - Construction Safety Orders, Chapter 4, Subchapter 4.
- C. California State License Board (CSLB), California Business and Professions Code Section 7058.5.
- D. Bay Area Air Quality Management District (BAAQMD) Regulations, including Regulation 11, Rule 2, dated November 5, 1990.

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E. California EPA - Title 22 and 23, California Administrative Code
Disposal Requirements.

F. California State Board of Equalization Excise Tax Unit.

1.4.5 LOCAL REQUIREMENTS: Not Applicable**1.4.6 PERMITS/LICENSES:**

The Abatement Contractor shall apply for and have on-site all required permits and licenses to perform abatement work as required by Federal, State, and Local regulations. VPIH shall review and state permit shall be obtained and submitted to COR. Ensure dates of demolition/abatement are accurate. If they are anticipated to change an ammendment will have to be applied for at the state level and COR notified of the date changes.

1.4.7 POSTING AND FILING OF REGULATIONS:

Maintain one (1) copy of all applicable federal, state, and local regulations. The regulations will be kept in the Abatement Contractor's office for access. If required, the Contractor shall comply with all applicable State licensing requirements. Post state permit, along with any other signage required by EPA/OSHA/AHERA standards for notification of hazards and unauthorized personnel.

1.4.8 VA RESPONSIBILITIES:

Prior to commencement of work:

- A. Notify occupants adjacent to regulated areas of project dates and requirements for relocation, if needed. Typically, in a total demolition, no occupants will be in the building. Arrangements must be made prior to starting work for relocation of desks, files, equipment and personal possessions to avoid unauthorized access into the abatement regulated area. Notify COR 72 hours in advance and accompany to survey areas for items to be removed and salvaged.

1.4.9 SITE SECURITY:

- A. Regulated area access is to be restricted only to authorized, trained and protected personnel. These may include the Abatement Contractor's employees, employees of Subcontractors, VA employees and

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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 office of the Abatement Contractor.

- B. Entry into the regulated area by unauthorized individuals shall be reported immediately to the Abatement Contractor's Competent Person/VACO by anyone observing the entry.
- C. The Abatement Contractor's Competent Person shall control site security during abatement operations as required by OSHA/State in order to isolate work in progress and protect adjacent personnel.
- D. Regulated areas shall be secured during non-working hours and checked by VA security. VA security is not responsible for area after-hours or at any point. Once space is turned over it is the sole responsibility of the KTR, and must be shown to prevent unauthorized access. Contractor shall submit list of names and qualifications for the abatement plan signed by a qualified person and include times/dates of work anticipated.

1.4.10 EMERGENCY ACTION PLAN AND ARRANGEMENTS:

- A. An Emergency Action Plan shall be developed by the Abatement Contractor prior to commencing abatement activities and shall be agreed to by the Abatement Contractor and the VA representative. The Plan shall meet the requirements of OSHA 29 CFR 1910.38 (a);(b).
- B. Emergency procedures shall be in written form and prominently posted. All personnel must be trained prior to entering regulated areas in these procedures and sign that they understand the emergency procedures.
- C. Emergency planning shall include written notification of police, fire, and emergency medical personnel of planned abatement activities; work schedules and any barriers that may affect response capabilities.
- D. Abatement Contractor emergency planning shall include consideration of asbestos exposure, fire, explosion, hazardous atmospheres, electrical hazards, slips/trips and falls, confined spaces, and heat stress illness, as needed. Written procedures for response to anticipated emergency situations shall be developed.
- E. Employees shall be trained in site evacuation procedures in the event of workplace emergencies.
 - 1. For non life-threatening situations - employees injured or otherwise incapacitated shall follow procedures with assistance from fellow workers, if necessary.

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2. For life-threatening injury or illness, secure proper medical treatment.
- F. Telephone numbers of all emergency response personnel shall be prominently posted along with the location of the nearest telephone.
- G. The Abatement Contractor shall provide verification of first aid/CPR training for personnel responsible for providing first aid/CPR. OSHA requires medical assistance within 3 minutes of a life-threatening injury/illness. Bloodborne Pathogen training shall also be verified for those personnel designated to provide first aid/CPR.
- H. The Abatement Contractor shall provide a physician's approved first aid kit for use on the project. The first aid kit will be kept in the Abatement Contractor's office area.
- I. 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, asbestos exposure; fire; accident; power failure and confined spaces. The Abatement Contractor shall detail procedures to be followed in the event of an incident assuring that work is stopped until correction of the problem.

1.4.11 ACCIDENT PREVENTION

- A. The Abatement Contractor shall provide and maintain a work environment and procedures which will safeguard the public and VA staff personnel, property, materials, supplies, and equipment which may be adjacent to the Abatement Contractor's regulated areas. The Abatement Contractor will avoid interruptions of VA operations so the project will be completed on schedule.
- B. While performing abatement activities, the Abatement Contractor shall provide all/any required safety barricades, signs, and signal lights. The Abatement Contractor shall comply with all applicable standards related to abatement operations as mandated by OSHA/EPA/State Standards. The Abatement Contractor shall provide a copy of and comply with the pertinent provisions of the latest version of the U.S. Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1.
- C. Whenever the Contracting Officer (CO) becomes aware of any noncompliance with these requirements or any condition which poses a serious or imminent danger to the health or safety of the public or VA patients/personnel, the CO shall notify the Abatement Contractor's

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Competent Person orally, with written confirmation and request immediate corrective action(s) be taken to abate the noncompliant condition. This notice, when delivered to the Abatement Contractor or the Contractor's representative, shall be deemed sufficient notice of noncompliance and that corrective action is required. The Abatement Contractor shall take corrective action immediately upon receipt of the oral/written notice. If the Abatement Contractor fails or refuse to promptly take corrective action, the CO has the option to issue an order to stop all or part of the work until correction actions have been taken. The Abatement Contractor shall have no entitlement to any equitable adjustment of the contract price or extension of the performance schedule based on any stop work order issued under this clause.

- D. The Abatement Contractor shall include the provisions of 1.4.11 in any subcontractor agreement.
- E. The Abatement Contractor shall submit a written plan for implementing 1.4.11. The plan shall include an analysis of any significant hazards to life, limb, and property inherent to abatement work and a plan for controlling these hazards.
- F. The Resident Engineer or other designated VA employee, if designated by the CO, shall serve as the Safety Officer and has authority to enforce the Accident Prevention requirements.

1.4.12 PRE-ABATEMENT MEETING:

Prior to commencing the work, the Abatement Contractor shall meet with the VA Representative to present and review, as appropriate, the items following this paragraph. The Abatement Contractor's Competent Person(s) who will be on-site shall participate in the pre-abatement meeting. The pre-abatement meeting is to discuss and determine procedures to be used related to the implementation of this specification during the project. At this meeting, the Abatement Contractor shall provide:

- A. Proof of Contractor State licensing.
- B. Proof the Competent Person is trained and approved for working in this State. Verification of the experience of the Competent Person shall also be presented.
- C. A list of all workers who will participate in the project, including experience and verification of medical surveillance and training certification/card.

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- D. A list of and verification of training for all personnel who have current first-aid/CPR/bloodborne pathogen training. A minimum of one person per shift must be the designated first aid provider.
- E. A copy of the Abatement Contractor's Standard Operating Procedures for Abatement. In these procedures, the following information must be detailed and specific for this project.
 - 1. Abatement regulated area isolation/preparation procedures;
 - 2. Abatement methods/procedures and equipment to be used;
 - 3. Personal protective equipment to be used;
 - 4. Sampling strategy plan to be used at the site.
- F. A list of the locations and abatement methods for RACM.
- G. A list of ACM to remain in place.
- H. At this meeting the Abatement Contractor shall provide all submittals as required by the specification.
- I. Emergency Action Plan and Accident Prevention Plan procedures.
- J. Abatement Plan shall be submitted in accordance with AHERA (and EPA/OSHA) standards, and shall be signed/supervised by a professional Industrial Hygienist.

1.5 ABATEMENT PROJECT COORDINATION:

Following are the minimum personnel necessary for coordination of the abatement work.

1.5.1 PERSONNEL

- A. Personnel shall consist of a qualified Competent Person/On-site Supervisor as defined by OSHA in the Construction Standards; OSHA Lead in Construction Standard and EPA NESHAP's Standard. These employees are the Abatement Contractor's representatives responsible for the Abatement Contractor's compliance with these specifications and all other applicable requirements related to abatement activities. Supervisor must be State accredited, if required.
- 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. A request for approval shall be submitted for any person to be employed during the project giving the

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person's name; social security number; qualifications; training; medical approval; fit tested and Certificate of Worker's Acknowledgment.

C. Minimum qualifications for Abatement Contractor and assigned personnel are:

1. The Abatement 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 abatement regulations in the past three (3) years; has adequate liability/occurrence insurance for asbestos work; is licensed in applicable states; has adequate and qualified personnel available to complete the work; has comprehensive standard operating procedures for abatement work; has adequate 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-site Supervisor 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; has completed EPA/OSHA/State/Local training requirements for awareness training and refreshers for asbestos and lead.

D. Contractor's Professional Industrial Hygienist meeting requirements for Professional IH.

E. Contractor's IH must oversee/sign plan and is responsible for overall work of the asbestos project. IH can be third party.

1.6 WORKER PROTECTION:

1.6.1 TRAINING OF ABATEMENT PERSONNEL:

Prior to beginning any abatement activity, all personnel shall be trained in accordance with OSHA 29 CFR 1926 and any additional State/Local requirements. If required by the work, training must include lead awareness training provided by a third party trainer. The OSHA Construction Safety 10 Hour course shall be required for all on-site contractor's personnel. AHERA training is required for all asbestos abatement personnel.

1.6.2 PERSONAL PROTECTIVE EQUIPMENT:

Provide, at a minimum, steel toe boots, hard hats, safety glasses, protective clothing, respiratory protection and any other personal

protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). A copy of the hazard assessment shall be provided to the VPIH. The Competent Person and CPIH shall ensure the provision of and the integrity of personal protective equipment worn for the duration of the project.

1.7 RESPIRATORY PROTECTION:

1.7.1 GENERAL - RESPIRATORY PROTECTION PROGRAM:

The Abatement Contractor shall develop and implement a Respiratory Protection Program (RPP) which is in compliance with the January 8, 1998 OSHA requirements found at 29 CFR 1926.1101 and 29 CFR 1910.132;134. ANSI Standard Z88.2-1992 provides excellent guidance for developing a respiratory protection program. All respirators used must be NIOSH approved for asbestos abatement activities. The written respiratory protection shall, at a minimum, contain the basic requirements found at 29 CFR 1910.134 (c)(1)(i - ix) - Respiratory Protection Program. Submit respiratory protection program for review 14 days prior to implementation. Also submit medical testing and fit testing.

1.7.2 RESPIRATORY PROTECTION PROGRAM COORDINATOR:

The Respiratory Protection Program Coordinator (RPPC) must be identified and shall have two (2) years experience coordinating the program. The RPPC must provide a signed statement attesting to the fact that the program meets the above requirements.

1.7.3 SELECTION AND USE OF RESPIRATORS:

The procedure for the selection and use of respirators must be submitted to the VA as part of the Abatement Contractor's qualification. 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 for reference by employees or authorized visitors.

1.7.4 MINIMUM RESPIRATORY PROTECTION

Minimum respiratory protection shall be a full face powered air purifying respirator when fiber levels are maintained consistently at or below 0.5 f/cc. A higher level of respiratory protection may be provided or required, depending on fiber levels. Respirator selection shall meet

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the requirements of 29 CFR 1926.1101 (h); Table 1, except as indicated in this paragraph. Abatement personnel must have a respirator for their exclusive use.

1.7.5 MEDICAL WRITTEN OPINION:

No employee shall be allowed to wear a respirator unless a physician has determined they are capable of doing so and has issued a written opinion for that person.

1.7.6 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.

1.7.7 RESPIRATOR FIT CHECK:

The Competent Person shall assure that the positive/negative fit check is done each time the respirator is donned by an employee. Headcoverings must cover respirator headstraps. Any situation that prevents an effective facepiece to face seal as evidenced by failure of a fit check shall preclude that person from wearing a respirator until resolution of the problem.

1.7.8 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.

1.8 WORKER PROTECTION:**1.8.1 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.

1.8.2 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. The physician's written opinion as required by 29 CFR 1926.1101 (m)(4) shall be provided for each person and shall include in the opinion the person has been evaluated for working in a heat stress environment while wearing personal protective equipment and is able to perform the work.

1.8.3 PROTECTIVE CLOTHING:

Provide boots, booties, hard hats, goggles, clothing, respirators and any other personal protective equipment as determined by conducting the hazard assessment required by OSHA at 29 CFR 1910.132 (d). Provide all personnel entering the regulated area with disposable full body coveralls, disposable head covering, and 18 inch boot coverings. The Competent Person shall ensure the integrity of personal protective equipment worn for the duration of the project. Provide plastic/rubber disposable gloves for hand protection. Cloth type gloves may be worn under plastic/rubber gloves, but cannot be used alone. Duct tape shall be used to secure all suit sleeves to wrists and to secure foot coverings at the ankle.

1.8.4 REGULATED AREA ENTRY PROCEDURE:

Worker protection shall meet the most stringent requirement. 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.

1.8.5 DECONTAMINATION PROCEDURE - PAPR:

The Competent Person shall require all personnel to adhere to following decontamination procedures whenever they leave the regulated area:

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- A. When exiting the regulated area, remove disposable coveralls, and ALL other clothes, disposable head coverings, and foot coverings or boots in the equipment room.
- B. 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 asbestos fibers while showering. The following procedure is required as a minimum:
 - 1. Thoroughly wet body including hair and face. If using a PAPR hold blower above head to keep filters dry.
 - 2. 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.
 - 3. 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.
- C. 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!
- D. Shower and wash body completely with soap and water. Rinse thoroughly.
- E. Rinse shower room walls and floor to drain prior to exiting.
- F. Proceed from shower to clean room; dry off and change into street clothes or into new disposable work clothing.

1.8.6 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:**1.9.1 DESCRIPTION:**

Provide each regulated area with separate personnel (PDF) and equipment/waste decontamination facilities (EWDF). 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 EWDF. Separate shower facilities must be provided for males/females as per OSHA requirements. See drawings for minimum requirements of each and OSHA 29 CFR 1926.1101, Appendix F.

1.9.2 GENERAL REQUIREMENTS:

All personnel entering or exiting a regulated area shall follow the requirements at 29 CFR 1926.1101 (j)(1) and these specifications. All equipment and materials must exit the regulated area through the EWDF and be decontaminated in accordance with these specifications. Walls and ceilings of the PDF and EWDF must be constructed of a minimum of 2 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 2 layers of 6 mil poly shall also be used to cover the floor under the EWDF and PDF units. Construct doors so that they overlap and secure to adjacent surfaces. Weigh sheets with layers of duct tape 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.

1.9.3 TEMPORARY FACILITIES TO THE PDF AND EWDF:

The Abatement Contractor shall provide temporary water service connections to the EWDF and PDF. 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 electric power with ground fault protection and overhead wiring in the EWDF and PDF. Provide a sub-panel for all temporary power in the clean room. Provide adequate lighting to provide a minimum of 50 foot candles in the EWDF and PDF. Provide temporary heat to maintain 70°F throughout the PDF and EWDF except the shower of the PDF shall be maintained at 75°F.

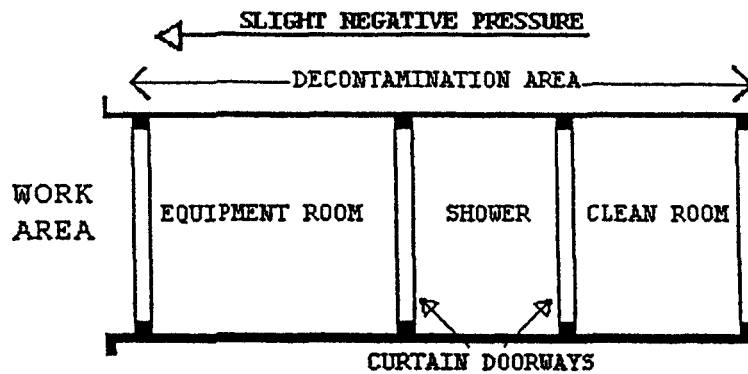
1.9.3 PERSONNEL DECONTAMINATION FACILITY (PDF):

The Abatement Contractor shall provide a PDF consisting of shower room which is contiguous to a clean room and equipment room. 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 2 layers of 6 mil fire retardant poly to provide an air tight room. Provide a minimum of 2 - 900 mm (3 foot) wide flapped 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 condition. Shower overflow shall not be allowed into the clean room. All surfaces in the clean room shall be disinfected twice after each shift change. An adequate supply of disposable towels and disposable protective clothing shall be provided. Provide 1 storage lockers per person. Portable fire extinguisher, 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. 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 can enter or exit the PDF during 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 regulated area 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

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- 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 2 layers of 6 mil 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, reusable footwear and for use as a change station for personnel exiting the regulated area. The equipment room shall be separated from the regulated area by a minimum 3 foot wide door made of three layers of 6 mil 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 2 layers of 6 mil fire retardant poly. If the airborne level of asbestos in the regulated area is expected to exceed 0.5 f/cc, add an intermediate cleaning space between the equipment room and the regulated area. 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. Provide a temporary electrical sub-panel in this room to accommodate any power tools and equipment used in the regulated area.
4. The PDF shall look like 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 is minimum of double flaps of 6 mil fire retardant poly.



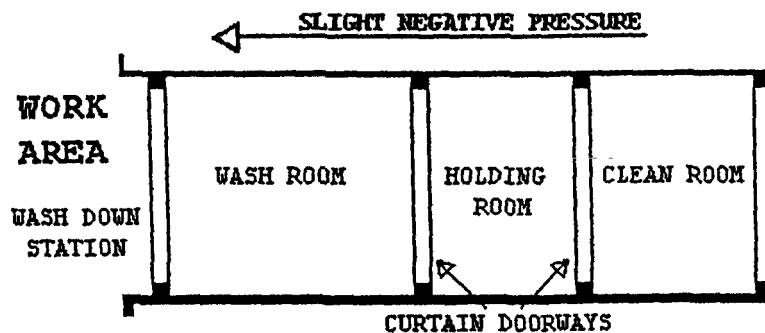
1.9.5 EQUIPMENT/WASTE DECONTAMINATION FACILITY (EWDF):

The Competent Person shall provide an EWDF consisting of a wash room, holding room, and clean room for removal of equipment and material from the regulated area. Personnel shall not enter or exit the EWDF except in the event of an emergency. Clean debris and residue in the EWDF daily. All surfaces in the EWDF shall be wiped/hosed down after each shift and all debris shall be cleaned from the shower pan. The EWDF shall consist of the following:

1. 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.
2. 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" x 4") wood framing and 2 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 two layers of 6 mil fire retardant poly.
3. 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" x 4") wood framing and 2 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

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- it goes through the holding room. Doorways in the holding room shall be constructed of two layers of 6 mil fire retardant poly.
4. Clean Room: Provide a clean room to isolate the holding room from the building exterior. Construct the clean room using 2 x 4 PVC (or equivalent) framing 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 two layers of 6 mil fire retardant poly.
 5. The EWDF shall be provided as follows: Wash Room leading to a Holding Room followed by a Clean Room leading to the Outside. See diagram.

**1.9.6 EQUIPMENT/WASTE DECONTAMINATION PROCEDURES:**

At 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 EWDF, other than the doorway between the washdown station and the Wash Room. Keep all outside personnel clear of the EWDF. 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. These personnel shall wear full protective clothing and appropriate respirators. At no time shall personnel from the clean side be allowed to enter the Wash Room.

PART 2 - PRODUCTS, MATERIALS AND EQUIPMENT**2.1 MATERIALS AND EQUIPMENT****2.21.1 GENERAL REQUIREMENTS (ALL ABATEMENT PROJECTS):**

Prior to the start of work, the abatement 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 has submitted verification to the VA's representative to this effect:

- A. All materials shall be delivered in their original package, container or bundle bearing the name of the manufacturer and the brand name (where applicable).
- B. 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 materials cannot be stored inside buildings. Replacement materials shall be stored outside of the regulated area until abatement is completed.
- C. The Abatement Contractor shall not block or hinder use of buildings by placing materials/equipment in any unauthorized place.
- D. 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.
- E. Polyethylene sheeting for walls in the regulated area shall be a minimum of 4-mil thick. For floors and all other uses, sheeting of at least 6-mil thickness shall be used in widths selected to minimize the frequency of joints. Fire retardant poly shall be used throughout.
- F. 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 or other waterproof tape, furring strips, spray glue, staples, nails, screws, lumber and plywood for enclosures or other effective procedures capable of sealing polyethylene to dissimilar finished or unfinished surfaces under both wet and dry conditions (including the use of amended water).
- G. Polyethylene sheeting utilized for personnel decontamination facility shall be opaque white or black in color, 6 mil fire retardant poly.
- H. Installation and plumbing hardware, showers, hoses, drain pans, sump pumps and waste water filtration system shall be provided.

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- I. An adequate number of negative pressure units capable of providing a minimum of 4 actual air changes per hour in the regulated area while maintaining -0.02" water column plus two reserve units available to replace any malfunctioning unit without delay shall be provided.
- J. An adequate number of HEPA vacuums, air sampling pumps and loaded filter cassettes, supplied air system, if used, providing Grade D breathing air with respirators and air lines sufficient for personnel, pressure differential gauge and recording capability shall be provided.
- K. An adequate number of 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 equipped with ground-fault circuit protection.
- L. 6 mil disposal bags for asbestos waste shall be pre-printed with labels and markings as required by OSHA, EPA and DOT regulations.
- M. The VA shall be provided a copy of the MSDS as required for all hazardous chemicals under OSHA 29 CFR 1910.1200 - Hazard Communication. Methylene chloride shall not be used with any spray adhesive or other product.
- N. DANGER 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.
- O. Adequate respirators, disposable protective clothing, hard hats, goggles, gloves and footwear for the project and number of personnel/shifts shall be provided. All personal protective equipment issued must be based on a hazard assessment conducted under 29 CFR 1910.132(d).

2.1.2 NEGATIVE PRESSURE FILTRATION SYSTEM:

The Abatement Contractor shall provide enough HEPA negative air machines to completely exchange the regulated area air volume 4 actual times per hour. The Competent Person shall determine the number of units needed for each regulated area by dividing the cubic feet in the regulated area by 15 and then dividing that result by the actual cubic feet per minute

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(cfm) for each unit to determine the number of units needed to effect 4 air changes per hour. Provide a standby unit in the event of machine failure and/or emergency in an adjacent area.

2.1.1.3 DESIGN AND LAYOUT:

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. Manufacturer's information on the negative air machine(s).
2. Method of supplying power to the units and designation/location of the panels.
3. Description of testing method(s) for correct air volume and pressure differential. Provide manufacturer's product data on the pressure differential measuring device used.
4. 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.

2.1.1.4 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" 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 be the air moving capacity 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 individually tested and

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certified on site by an independent testing firm to have an efficiency of not less than 99.97% when challenged with 0.3 μm dioctylphthalate (DOP) particles. 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. Exhaust air shall be HEPA filtered, discharged outside the building and affixed with a certifying "DOP PASS" sticker dated within the past six months.

- 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 or larger. Pre-filters shall be installed either on or in the intake grid of the unit and 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 at that point. 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 Underwriter's Laboratories (UL). Each unit must be provided with overload protection and the motor, fan, fan housing, and cabinet must be grounded.

2.1.5 PRESSURE DIFFERENTIAL:

The fully operational negative air system within the regulated area shall continuously maintain a pressure differential of -0.02" water column. 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(e)(5)(i). The Competent Person shall be responsible for providing and maintaining the negative pressure and air changes as required by OSHA and this specification.

2.1.6 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 -0.02" water column for the duration of the project.

2.1.7 AUXILIARY GENERATOR:

Provide an auxiliary gasoline/diesel generator located outside the building in an area protected from the weather. Provide, so that in the event of a power failure, the generator must automatically start and supply power to a minimum of 50% of the negative air machines in operation.

2.1.8 SUPPLEMENTAL MAKE-UP AIR INLETS:

Provide, as needed for proper air flow in the regulated area, in a location approved by the VA, by making 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. The flap must be sprayed with adhesive to assure sealing if it closes.

2.1.9 TESTING THE SYSTEM:

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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. Testing must also be done at the start of each work shift.

2.1.10 DEMONSTRATION OF THE NEGATIVE AIR PRESSURE SYSTEM:

The demonstration of the operation of the negative pressure system to the VA shall include, but not be limited to, the following:

- A. Plastic barriers and sheeting move inwards in the regulated area.
- B. Curtains of the decontamination units move towards the regulated area.
- C. 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 to the regulated area.
- D. Use smoke tubes to demonstrate air is moving air across all areas in which work is to be done. Use a differential pressure gauge to indicate a negative pressure of at least 5.0 Pa (-0.02") across every barrier separating the regulated area from the rest of the building. Modify the system as necessary to meet the above requirements.

2.1.11 USE OF SYSTEM DURING ABATEMENT OPERATIONS:

- A. Start units before beginning any disturbance of RACM occurs. After work begins, the units shall run continuously, maintaining 4 actual air changes per hour at a negative pressure differential of 5.0 Pa (-0.02") water column, for the duration of the work until a final visual clearance and final air clearance has been completed.
- B. The negative air machines shall not be shut down for the duration of the project unless authorized by the COTR/VPIH, in writing.
- C. 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 necessary are operating properly again.

- D. 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 completed for that regulated area.

2.1.12 DISMANTLING THE SYSTEM:

After completion of the final visual and final air clearance has been obtained, the units may be shut down. The units shall have been completely decontaminated, all pre-filters removed and disposed of as asbestos waste, and the unit inlet and outlet sealed with 2 layers of 6 mil poly.

2.2 CONTAINMENT BARRIERS AND COVERINGS IN THE REGULATED AREA:**2.2.1 GENERAL:**

Seal off the perimeter to the regulated area to completely isolate the regulated area from adjacent spaces. Should adjacent areas become contaminated, immediately stop work and clean up the contamination at no additional cost to the Government.

2.2.2 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. Remove all uncontaminated removable furniture, equipment and/or supplies from the regulated area before commencing work. Lock out and tag out any HVAC systems in the regulated area.

2.2.3 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 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 opaque fire retardant poly sheeting at least 4 mils thick to prevent building occupant observation.

2.2.4 CRITICAL BARRIERS:

Completely separate the regulated area from adjacent areas using fire retardant poly at least 4 mils thick and duct tape. Individually seal with two layers of 6 mil poly and duct tape all HVAC openings into the regulated area. Use care with hot/warm surfaces.

2.2.5 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"). Seams must overlap at least 1800 mm (6') and must be spray glued and taped. Install sheeting so that layers can be removed independently from each other. Mechanically support and seal with duct tape and glue all wall layers.
- B. Elevator doors must be covered with 2 layers of 6 mil fire retardant poly. The elevator door must be in a positively pressurized area outside the clean room of the PDF.
- C. If stairs and ramps are covered with 6 mil plastic, two layers must be used. Provide 19 mm (3/4") exterior grade plywood treads held in place with duct tape/glue on the plastic. Do not cover rungs or rails with any isolation materials.

2.2.6 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.

2.2.7 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. If the affected area cannot be added to the regulated area, decontamination measures must be started immediately and continue until air monitoring indicates background levels are met.

2.3 MONITORING, INSPECTION AND TESTING:**2.3.1 GENERAL:**

- A. Perform throughout abatement work monitoring, inspection and testing inside and around the regulated area in accordance with the OSHA requirements and these specifications. The CPIH shall periodically inspect and oversee the performance of the Contractor IH Technician. The

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IH Technician shall continuously inspect and monitor conditions inside the regulated area to ensure compliance with these specifications. In addition, the CPIH shall personally manage air sample collection, analysis, and evaluation for personnel, regulated area, and adjacent area samples to satisfy OSHA requirements. Additional inspection and testing requirements are also indicated in other parts of this specification.

- B. The VA will employ an independent industrial hygienist (VPIH) consultant to perform various services on behalf of the VA. The VPIH 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 consultant in no way relieves the Abatement 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 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 Abatement Contractor.
- C. If fibers counted by the CPIH/VPIH during abatement work, either inside or outside the regulated area, utilizing the NIOSH 7400 air monitoring method, exceed the specified limits, the Abatement Contractor shall stop work. The Abatement Contractor may request confirmation of the results by analysis of the samples by TEM. Request must be in writing and submitted to the COTR representative. Cost for the confirmation of results will be borne by the Abatement 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 with review and approval of the VPIH. An agreement between the CPIH and the VPIH 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. Any air samples sent off-site must go to a NIST-NVLAP accredited laboratory.

2.3.2 SCOPE OF SERVICES OF THE VPIH CONSULTANT:

- A. The purpose of the work of the VPIH is to: Assure quality; resolve problems; and prevent the spread of contamination beyond the regulated area. In addition, their work includes performing the final visual inspection and air testing, if required, to determine whether the regulated area or building has been adequately decontaminated. If the State/Local requirements do not mandate a final clearance air sampling, a final air clearance may not be needed. All air monitoring is to be done utilizing PCM with an option to utilize TEM after approval from the VPIH. The VPIH will perform the following tasks:
1. Task 1: Perform air monitoring and visual inspection 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.
 2. Task 2: 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.
 3. Task 3: Inspect the regulated areas to assure/certify that ACM left in place during the demolition activity did not become friable.
 4. Task 4: Provide support to the VA representative such as evaluation of submittals from the Abatement Contractor, resolution of unforeseen developments, etc.
 5. Task 5: Perform, in the presence of the VA representative, final inspection and testing, if needed, of a decontaminated regulated area or building at the conclusion of the abatement and clean-up work to certify compliance with the VA requirements.
 6. Task 6: Issue certificate of decontamination for each regulated area or building.
- B. All data, inspection results and testing results generated by the VPIH will be available to the Abatement Contractor for information and consideration. The Abatement Contractor shall cooperate with and support the VPIH for efficient and smooth performance of their work.
- C. The monitoring and inspection results of the VPIH will be used by the VA to issue any stop removal orders to the Abatement Contractor during

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abatement work and to accept or reject a regulated area or building as decontaminated.

- D. All air sampling and analysis data will be recorded on VA Form 10-0018.

2.3.3 MONITORING, INSPECTION AND TESTING BY ABATEMENT CONTRACTOR:

The CPIH 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 is responsible for the continuous monitoring of all subsystems and procedures which could affect the health and safety of the Abatement Contractor's personnel and cause negative impact on the environment. The CPIH shall inspect the project and certify that ACM left in place during the abatement project did not become friable as a result of the abatement activity. Safety and health conditions and the provision of those conditions inside and outside the regulated area for all persons entering the regulated area is the exclusive responsibility of the Abatement 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 air sampling and analysis. The IH Technician shall have a NIOSH 582 Course or equivalent and show proof. The IH Technician shall participate in the AIHA Asbestos Analysis Registry or participate in the Proficiency Analytic Testing program of AIHA for fiber counting quality control assurance. The IH Technician shall also be an accredited EPA/State Contractor/Supervisor. The IH Technician shall have participated in five abatement projects collecting personal and area samples as well as responsibility for documentation. Ten (10)% of all samples analyzed in the field shall be sent to an AIHA accredited Laboratory for confirmation. The analytic laboratory used by the Abatement Contractor to analyze the samples shall be AIHA accredited for asbestos PAT. A daily log documenting all OSHA requirements for 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. The log will contain, at a minimum, information on personnel or area sampled, other persons represented by the sample, the date of sample collection, start and stop times for sampling, sample volume, flow rate, and fibers/cc. Take 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 personal samples per shift shall be collected and one area sample per 1,000 square feet of regulated area where abatement is taking place and one sample per shift in the clean room area shall be collected. In addition to the continuous monitoring required, the CPIH will perform inspection during abatement to assure work practices are in accordance with the specification and that no ACM which is non-friable has become friable during the abatement work. Testing shall be done at the end of abatement for each regulated area or building as specified in the CPIH responsibilities. The work of the IH Technician shall be reviewed and certified by the CPIH.

2.4 STANDARD OPERATING PROCEDURES:

The Asbestos Abatement Contractor shall have established Standard Operating Procedures (SOP's) in printed form and loose leaf folder consisting of simplified text, diagrams, sketches, and pictures that establish and explain clearly the ways and procedures to be followed during all phases of the work by the contractor's personnel. The SOP's must be modified as needed to address specific requirements of the project. The SOP's shall be submitted for review and approval prior to the start of any abatement work. The minimum topics and areas to be covered by the SOP's are:

- A. Minimum Personnel Qualifications.
- B. Contingency Plans and Arrangements.
- C. Security and Safety Procedures.
- D. Respiratory Protection/Personal Protective Equipment Program and Training.
- E. Medical Surveillance Program and Recordkeeping.
- F. Regulated Area Requirements - Containment Barriers/Isolation of Regulated Area.
- G. Decontamination Facilities and Entry/Exit Procedures (PDF and EWDF).
- H. Negative Pressure Systems Requirements.
- I. Monitoring, Inspections, and Testing.
- J. Removal Procedures for RACM and ACE.
- K. Removal Procedures for RACM discovered during building demolition shall be provided as per NESHAP's.
- L. Removal of Contaminated Soil (if applicable).

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- M. Disposal of RACM and ACE as per NESHAP's; OSHA; and DOT for friable asbestos including NESHAP's/DOT shipping papers example. Disposal requirements for non-friable waste as per OSHA requirements.
- N. Regulated Area Decontamination/Clean-up.
- O. Regulated Area Visual and Air Clearance, if required.
- P. Project Completion/Closeout.

2.5 SUBMITTALS:**2.5.1 PRE-CONSTRUCTION MEETING SUBMITTALS:**

Submit to the VA a minimum of 14 days prior to the pre-construction meeting the following for review and approval. Meeting this requirement is a prerequisite for the pre-construction 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 Standard Operating Procedures developed specifically for this project, including the removal of RACM discovered during demolition, incorporating the requirements of the specifications, prepared, signed and dated by the CPIH.
- D. Submit the specifics of the materials and equipment to be used for this project with brand names, model numbers, performance characteristics, pictures/diagrams, and number available for the following:
 - 1. 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. Surfactants, hand held sprayers, airless sprayers, glovebags, fire extinguishers.
 - 4. Respirators, protective clothing, 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

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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. Air monitoring must be done in accordance with OSHA 29 CFR 1926.1101(f) and Appendix A. Include the accreditation number of the Laboratory.
- 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, penalties, damages paid and legal actions taken against the company 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; provide references; phone numbers; copies of certificates, accreditations, and licenses. Submit an affidavit signed by the CPIH stating that all personnel submitted below have medical records in accordance with OSHA 29 CFR 1926.1101(m) and 29 CFR 1910.20 and that the company has implemented a medical surveillance program and maintains recordkeeping in accordance with the above regulations. Submit the phone number and doctor/clinic/hospital used for medical evaluations.
 - 1. CPIH: 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; number of workers trained; samples of training materials; samples of

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- SOP's developed; samples of articles published; physician written medical opinion; current respirator fit test.
2. IH Technician: Name; years of abatement experience; list of projects similar to this one; certifications; accreditations; proof of AHERA training; physicians written medical opinion; and current respirator fit test.
 3. Competent Person(s)/Supervisor(s): Number; names; social security numbers; years of abatement experience as Competent Person/Supervisor; list of similar projects 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; current respirator fit test.
 4. Workers: Numbers; names; social security numbers; years of abatement experience; certificates, licenses, accreditations; training courses in asbestos abatement and respiratory protection; medical opinion; 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 english the coverage provided and the fact that asbestos abatement activities are covered by the policy; copy of SOP's incorporating the requirements of this specification; information on who provides your training, how often; who provides medical surveillance, how often; who does and how is air monitoring conducted; a list of references of independent laboratories/IH's familiar with your air monitoring and standard operating procedures; copies of monitoring results of the five referenced projects listed and analytical method(s) used.
- K. When rental equipment is to be used in regulated areas or used to transport asbestos waste, the contractor shall assure complete decontamination of the rental equipment before return to the rental agency.

2.5.2 SUBMITTALS DURING ABATEMENT:

- A. 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,

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emergencies, and any cause for stopping work; representative air monitoring and results/TWA's/EL's. Submit this daily log to VA's representative.

B. The CPIH shall document and maintain the following during abatement and submit as appropriate to the VA's representative:

1. Inspection and approval of the regulated area preparation prior to start of work and daily during work.
2. Removal of any poly barriers.
3. Visual inspection/testing by the CPIH following abatement.
4. Packaging and removal of ACM waste from regulated area.
5. Disposal of ACM/ACE waste materials; copies of Waste Shipment Records/landfill receipts to the VA's representative on a weekly basis.

2.5.3 SUBMITTALS AT COMPLETION OF ABATEMENT:

The CPIH 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. The report shall include a certificate of completion, signed and dated by the CPIH, in accordance with Attachment #1. All clearance and perimeter samples must be submitted on VA Form 10-0018. The VA Representative will forward the abatement report to the Medical Center after completion of the project.

PART 3 - EXECUTION**3.1 PRE-ABATEMENT ACTIVITIES:****3.1.1 PRE-ABATEMENT MEETING:**

The VA representative, upon receipt, review, and substantial approval of all pre-abatement submittals and verification by the CPIH that all materials and equipment required for the project are on the site, will arrange for a pre-abatement meeting between the abatement contractor, the CPIH, Competent Person(s), the VA representative(s), and the VPIH. 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 abatement 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 abatement contractor. No abatement work of any kind described in the following provisions shall be initiated prior to the VA written order to proceed.

3.1.2 PRE-ABATEMENT INSPECTIONS AND PREPARATIONS:

Before any work begins on the construction of the regulated area, the abatement contractor will:

- A. The VA Representative, the abatement contractor, and the VPIH must be aware of 10/95 A/E Quality Alert indicating the failure to identify asbestos in the areas listed. The CPIH/Contractor shall inspect the project continually to assure that ACM not scheduled for removal is not made friable when the work is being performed. Make sure these areas are looked at/reviewed for the demolition project:

Lay-in ceilings concealing ACM; ACM behind walls/windows from previous renovations; inside chases/walls; transite piping/ductwork/sheets; behind radiators; roofing materials; below window sills; water/sewer lines; electrical conduit coverings; crawl spaces (previous abatement contamination); flooring/mastic covered by carpeting or walls; exterior insulated wall panels; on underground fuel tanks; steam line trench coverings.

- B. Shut down and lock out in accordance with 29 CFR 1910.147 all electrical circuits which pose a potential hazard. Electrical arrangements will be tailored to the particular regulated area and the systems involved. All electrical circuits affected will be turned off at the circuit box outside the regulated area, not just the wall switch. The goal is to eliminate the potential for electrical shock which is a major threat to life in the regulated area due to water use and possible energized circuits. Electrical lines used to power equipment in the regulated area shall conform to all electrical safety standards and shall be isolated by the use of a ground fault circuit interrupter (GFCI). All GFCI shall be tested prior to use. The VA's representative will monitor the electrical shutdown.

3.1.3 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.

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- B. Upon completion of all preparatory work, the CPIH 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 and may require that upon satisfactory inspection, the abatement contractor's employees perform all major aspects of the approved SOP'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. VPIH will perform visual and air clearance testing of any abatement conducted. This does not relieve the KTR of any clearance testing/inspections required by federal law in order to ensure compliance and safe turnover for other use and completed abatement.
- C. The CPIH 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 abatement contractor in writing to proceed with the asbestos abatement work in accordance with this specification.

3.2 REGULATED AREA PREPARATIONS:

- A. Post OSHA DANGER signs meeting the specifications of OSHA 29 CFR 1926.1101 at any location and approaches to the regulated area where airborne concentrations of asbestos may exceed ambient background levels. 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.
- B. Shut down and lock 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 requirements and OSHA requirements for temporary electrical systems. Electricity shall be provided by the VA.
- C. Shut down and lock out heating, cooling, and air conditioning system (HVAC) components that are in, supply or pass through the regulated area.

- D. The Contractor shall provide sanitary facilities for abatement personnel and maintain them in a clean and sanitary condition throughout the abatement project.
- E. 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. The Contractor shall be responsible for hot water provision to the shower(s).
- F. The Contractor shall not allow unauthorized persons into the regulated area without the written permission of the VAIH.

3.3 CONTAINMENT COVERINGS FOR THE REGULATED AREA:

3.3.1 GENERAL:

Seal off the perimeter of the regulated area to completely isolate the abatement project and to contain all airborne asbestos contamination created by the abatement activities. Should the adjacent area past the regulated area become contaminated due to improper work activities, the abatement contractor shall suspend work inside the regulated area, continue wetting, and clean the adjacent areas in accordance with procedures described in these specifications. Any and all costs associated with the adjacent area cleanup shall not be borne by the VA.

3.3.2 PREPARATION PRIOR TO SEALING OFF:

Place all materials, equipment and supplies necessary to isolate the regulated area inside the regulated area. Remove all movable material/equipment as described above and secure all unmovable material/equipment as described above. Properly secured material/equipment shall be considered to be outside the regulated area.

3.3.3 CONTROLLING ACCESS TO THE REGULATED AREA:

Access to the regulated area shall be permitted only through the PDF. All other means of access shall be closed off by proper sealing and DANGER signs posted on the clean side of the regulated area where it is adjacent to or within view of any occupiable area. An opaque visual barrier of at least 4 mil poly shall be provided so that the abatement work is not visible to any building occupants. If the area adjacent to the regulated area is accessible to the public, construct a solid barrier on the public side of the sheeting for protection and isolation

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of the project. The barrier shall be constructed with nominal 2" x 4" (50mm x 100mm) wood or metal studs 16" (400mm) on centers, securely anchored to prevent movement and covered with a minimum of 1/2" (12.5mm) plywood. Provide an appropriate number of OSHA DANGER signs for each visual and physical barrier. Any alternative method must be given a written approval by the VA's representative. Signs shall have verbiage as required by OSHA/EPA/AHERA. All signage shall be submitted for review by COR 14 days in advance for acceptance.

3.3.4 CRITICAL BARRIERS:

The regulated area must be completely separated from the adjacent areas, and the outside by at least 2 layers of 6 mil fire retardant poly and duct tape/spray adhesive. Individually seal all supply and exhaust ventilation openings, lighting fixtures, clocks, doorways, windows, convectors, speakers, and other openings into the regulated area with 2 layers of 6 mil fire retardant poly, and taped securely in place with duct tape/spray adhesive. Critical barriers must remain in place until all work and clearances have been completed. Light fixtures shall not be operational during abatement. Auxiliary lighting shall be provided. If needed, provide plywood squares 6" x 6" x 3/8" (150mm x 150mm x 18mm) held in place with one 6d smooth masonry/galvanized nail driven through the center of the plywood square and duct tape on the poly so as to clamp the poly to the wall/surface. Locate plywood squares at each end, corner, and 4' (1200mm) maximum on centers.

3.3.5 PRIMARY/SECONDARY BARRIERS:

- A. Floors: Cover the floor of the regulated area with at least two layers of 6 mil fire retardant poly, turning up the walls at least 12" (300mm). The poly must form a right angle at the floor-wall juncture so there is no radius which can be stepped on, possibly causing detachment of the poly. Spray glue and duct tape must both be used for floor seams. Floor seams must overlap a minimum of 6 feet (1800mm) or be at right angles to each other. The top sheet of poly must be able to be removed independently of the bottom layer. A third loose layer of 6 mil poly shall be used in the area of removal and periodically picked up to reduce contamination of the initial layers.
- B. Walls: All walls in the regulated area, including critical barriers, shall be covered with 2 layers of 4 mil fire retardant poly,

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mechanically supported and sealed with duct tape and/or spray glue.

Tape all joints, including the floor-wall joint, with duct tape/spray glue. All wall joints must overlap at least 6 feet (1800mm).

- C. Stairs and Ramps: Stairs or ramps covered in poly must be provided with 3/4" (36mm) exterior grade plywood treads securely held in place over the poly. Do not cover stairs or ramps with unsecured poly. Do not cover rungs or rails with any protective materials.

3.3.6 EXTENSION OF THE REGULATED AREA:

If the regulated area barrier is breached in any manner that could allow the passage of asbestos fibers or debris, the Competent Person shall immediately stop work, continue wetting, and proceed to extend the regulated area to enclose the affected area as per procedures described in this specification. If the affected area cannot be enclosed, decontamination measures and cleanup shall start immediately. All personnel shall be isolated from the affected area until decontamination/cleanup is completed as verified by visual inspection and air monitoring. Air monitoring at completion must indicate background levels.

3.4 REMOVAL OF RACM AND CAT I/CAT II ACM:**3.4.1 WETTING MATERIALS:**

- A. 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's regulation for the duration of the project. A removal encapsulant may be used instead of amended water with written approval of the VA's representative.
- B. Amended Water: Provide water to which a surfactant has been added shall be used 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 one ounce of 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with 5 gallons (19L) of water.

3.4.2 WET REMOVAL OF ACM OTHER THAN AMOSITE:

- A. Adequately and thoroughly wet the ACM to be removed prior to removal to reduce/prevent fiber release to the air. Adequate time must be allowed

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for the amended water 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. 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 in the case of electrical hazards or a greater safety issue is possible!

B. If ACM does not wet well with amended water due to coating or jacketing, remove as follows:

1. Mist regulated area continuously with amended water whenever necessary to reduce airborne fiber levels.
2. 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 tightly the bag neck, bend over (gooseneck) and seal with a minimum of three tight wraps of duct tape. Clean/decontaminate the outside of any residue and move to washdown station adjacent to EWDF.
3. 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 oversaturate 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 (6M), 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. Re-wet the substrate as needed to prevent drying before the residue is removed.
4. 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 oversaturate 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' x 6' (50mm x 150mm)

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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.

5. Pipe 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" from the point it contacts the ACM.

3.4.3 WET REMOVAL OF AMOSITE (IF APPLICABLE):

- A. 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 located no more than 600 mm (2') 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') square flared end piece on the intake of the duct. Support the duct horizontally at a point 600 mm (2') below the work to effect capture. One person in the crew shall be assigned to operate the duct collection system on a continual basis.
- B. 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 VA Representative. 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.

3.4.4 REMOVAL OF RACM CONTAMINATED SOIL AND OTHER SPECIAL PROCEDURES:**A. Removal of contaminated soil (If applicable):**

When working on soil contamination, pick up all visible asbestos debris using wet methods if possible after set-up of PDF, EWDF, negative air systems as required. Perform work and decontaminate/clean-up; and complete work as required in these specifications.

3.4.5 GLOVEBAG REMOVAL PROCEDURES

GENERAL: All applicable OSHA requirements and the VA 01570 Specification for glovebag removal shall be followed. The Contractor's SOP for glovebag removal shall minimally meet the above requirements.

3.5 DISPOSAL OF RACM AND ACM/ACE WASTE MATERIALS:**3.5.1 GENERAL:**

Dispose of waste RACM/ACM/ACE and debris which is packaged in accordance with these specifications, OSHA, EPA and DOT. The landfill requirements for packaging must also be met. Disposal shall be done at an approved facility. Disposal of non-friable ACM/ACE shall be done in accordance with applicable regulations. Some States regulate RACM as hazardous waste and manifesting the RACM would be required.

3.5.2 PROCEDURES:

- A. RACM waste shall be packaged and moved through the EWDF into a covered transport container in accordance with procedures in this specification. Waste shall be double-bagged prior to disposal. Wetted waste can be very heavy. Bags shall not be overfilled. Bags shall securely sealed to prevent accidental opening and/or leakage. The top shall be tightly twisted and goosenecked 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's 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.
- B. Waste Load Out: Waste load out shall be done in accordance with the procedures in EWDF Decontamination Procedures. Bags shall be

decontaminated on exterior surfaces by wet cleaning and/or HEPA vacuuming before being placed in the second bag.

- C. 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.

3.6 PROJECT DECONTAMINATION:

3.6.1 GENERAL:

The entire work related to project decontamination shall be performed under the close supervision and monitoring of the CPIH.

3.6.2 REGULATED AREA CLEARANCE:

Air testing and other requirements which must be met before release of the Abatement Contractor are specified in Final Testing Procedures.

3.6.3 WORK DESCRIPTION:

Decontamination includes the cleaning and clearance of the air 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 EWDF facilities, and negative pressure systems.

3.6.4 PRE-DECONTAMINATION CONDITIONS:

- A. Before decontamination starts, all ACM and ACE from the regulated area shall be removed, all waste collected and removed, and the secondary barrier of poly removed and disposed of along with any gross debris generated by the work.
- B. At the start of decontamination, the following shall be in place:
1. Primary barriers consisting of two layers of 6 mil poly on the floor and on the walls.
 2. Critical barriers consisting of two layers of 6 mil poly which is the sole barrier between the regulated area and the rest of the building or outside.

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3. Critical barrier poly over lighting fixtures, clocks, HVAC openings, doorways, windows, convectors, speakers and other openings in the regulated area.
4. Decontamination facilities for personnel and equipment in operating condition and the negative pressure system in operation.

3.6.5 CLEANING:

Clean all surfaces of the regulated area including items of remaining poly sheeting, tools, scaffolding, ladders/staging by wet methods and/or HEPA vacuuming. Do not use dry dusting/sweeping methods. Use each surface of a 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. If determined by the CPIH/VPIH additional cleaning(s) may be needed.

3.7 VISUAL INSPECTION AND AIR CLEARANCE TESTING:**3.7.1 GENERAL:**

Notify the VA representative 24 hours in advance for the performance of the visual inspection and air clearance testing, if required. The visual inspection and air clearance testing, if needed, will be performed by the VPIH after the CPIH has performed final air clearance testing, if needed.

3.7.2 VISUAL INSPECTION:

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 cost to the VA. Dust/material samples may be collected and analyzed at no cost to the VA at the discretion of the VPIH to confirm visual findings. When the regulated area is visually clean the final testing can be done.

3.7.3 AIR CLEARANCE TESTING:

- A. Since the areas will not be re-occupied by personnel after the completion of the abatement, air clearance testing is not required under

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OSHA/EPA AHERA. States may have rules for clearance testing that might require testing. Consult State rules for the facility and perform clearance testing if needed. After an acceptable visual inspection by the VA Representative AND Asbestos Consultant, the Asbestos Consultant will perform the final testing. If the release criteria are not met, the Abatement Contractor shall repeat the final cleaning and continue decontamination procedures. Additional inspection and testing will be done at the expense of the Abatement Contractor.

- B. If release criteria are met, proceed to perform the abatement closeout and to issue the certificate of completion in accordance with these specifications.

3.7.4 AIR CLEARANCE PROCEDURES:

- A. 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 with PCM methods, if required.
- B. Final Clearance Sampling: If required, the VPIH will secure samples and analyze them according to the NIOSH 7400 method. Samples must be confirmed at an AIHA accredited laboratory if samples are analyzed on-site.

3.7.5 CLEARANCE SAMPLING USING PCM:

- A. If required, and after the CPIH has provided clearance monitoring, the VPIH will perform background, adjacent area, and regulated area samples during construction, and clearance samples as directed by the VA Representative.
- B. The NIOSH 7400 method will be used for clearance sampling with a minimum collection volume based on a fiber density of 100 to 1300 fibers/sq.mm, (0.79 - 10.2 fibers/field) and a minimum detection limit of 0.005 f/cc or less.

3.8 ABATEMENT CLOSEOUT AND CERTIFICATE OF COMPLIANCE:**3.8.1 COMPLETION OF ABATEMENT WORK:**

- A. 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 clearance criteria and fulfilling the following:

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1. Remove all equipment, materials, and debris from the project area.
2. Package and dispose of all asbestos waste as required.
3. Fulfill other project closeout requirements as specified elsewhere in this specification.

3.8.2 CERTIFICATE OF COMPLETION BY CONTRACTOR:

The CPIH 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.

3.8.3 WORK SHIFTS:

All work shall 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.

ATTACHMENT #1

CERTIFICATE OF COMPLETION

DATE:

PROJECT NAME:

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.

Throughout the work, non-friable asbestos was not made friable during the work.

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 the negative pressure system was installed, operated and maintained in order to provide a minimum of 4 actual air changes per hour with a continuous -0.02" of water column pressure

Signature/Date:

Signature/Date:

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 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

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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:

Date:

Printed Name of CPIH:

Signature of Contractor:

Date:

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Printed Name of Contractor:

ATTACHMENT #4

ABATEMENT CONTRACTOR'S REVIEW AND ACCEPTANCE OF SPECIFICATIONS

This form shall be signed by the Abatement Contractor Owner and the Abatement Contractor's Competent Persons prior to any start of work related to this specification. If the Abatement Contractor's Competent Person has not signed this form, they shall not be allowed to act as the on-site Competent Person.

I, the undersigned, have read this entire specification regarding the abatement activities. I understand the requirements of the specifications and agree to follow the specifications 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 specifications and have been given an opportunity to ask any questions regarding the specifications content and have received a response related to those questions. I do not have any further questions regarding the content, intent and requirements of this specification.

At the conclusion of the total demolition asbestos abatement, I will certify that any ACM not scheduled for removal has been inspected during the course of the work and any ACM not scheduled for removal has not been made friable nor has it become friable.

Abatement Contractor Owner's Signature

Abatement Contractor Competent Person(s)

- - END- - -

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:

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- C. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.
- D. Seismic bracing: Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

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 with the minimum physical and structural properties indicated.
- C. Structural Performance: Engineer, fabricate, and erect cold-formed metal framing to withstand design loads within limits and under conditions required.
 - 1. Design Loads: As required by the 2012 International Building Code, the VA Physical Security Design Manual for VA Facilities for Mission Critical Facilities, and as required by the project conditions.
 - 2. 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).
 - 3. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.

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4. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials. The design seismic lateral drift is as indicated on the structural drawings.
5. 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.
6. Design framing and connections to structure to accommodate all design loading, including blast loads as specified.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, member and connection detailing, welding, fasteners, connectors and information necessary to complete installation as required by design and as specified. Drawings to indicate calculated design loads at connections to supporting structure. Drawings to be stamped and signed by a professional engineer registered in the State of California.
- C. Structural Calculations, to be prepared by and stamped and signed by a professional engineer registered in the State of California.
- D. Manufacturer's Literature and Data: Showing steel component sections and connectors and specifying structural characteristics.
- E. For cold-formed metal framing indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for its preparation.

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):
 1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)
- C. American Society of Testing and Materials (ASTM):
 1. A36/A36M-08 Standard Specifications for Carbon Structural Steel
 2. A123/A123M-09 Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 3. A153/A153M-09 Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
 4. A307-10 Standard Specifications for Carbon Steel Bolts and Studs

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5. A653/A653M-10 Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 6. C1107/C1107M-08 Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
 7. E488-96(R2003) Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
 8. E1190-95(R2007) Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members
- D. American Welding Society (AWS):
1. D1.3/D1.3M-08 Structural Welding Code-Sheet Steel
- E. Military Specifications (Mil. Spec.):
1. MIL-P-21035B Paint, High Zinc Dust Content, Galvanizing Repair

PART 2 - PRODUCTS**2.1 MATERIALS:**

- A. Sheet Steel for studs and accessories 16 gage and heavier: ASTM A653, structural steel, zinc coated G60, with a yield of 340 MPa (50 ksi) minimum.
- B. Galvanizing Repair Paint: MIL-P-21035B.
- C. 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: Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:
 1. Design Uncoated-Steel Thickness:
 - a. 52 mil (0.0566 inch). (16 gauge)
 2. Flange Width:
 - a. Minimum 41 mm (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.

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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 psi).
- 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. Deflection track and vertical slide clips.
 - 4. Stud kickers and girts.
 - 5. 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. Expansion Anchors: Tested and qualified for use in cracked concrete per ACI 355.2 and ICC-ES AC 193. Anchors to have a current ICC-ES report approved for cracked concrete (seismic) use under the 2012 IBC. Install anchors in accordance with the ICC-ES report and manufacturer's instructions. Provide stainless steel anchors for exterior use or when exposed to weather. Provide galvanized carbon steel anchors at other locations, unless otherwise noted.
- C. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.5 STEEL MESH BLAST MITIGATION SHIELDING

- A. Blast shielding expanded steel mesh, produced by simultaneously slitting and stretching a solid sheet of High Strength Low Alloy steel, making one continuous expanded metal mesh sheet; ASTM F 1267, Type II, Class 1, fabricated from hot rolled carbon steel sheets (ASTM A 1011/A 1011M).
 - 1. Weight: 3.66 Kg/m² (0.75 lbs/ft²)
 - 2. Overall thickness: 1.78 mm (0.070 inch)
 - 3. Percent open area: 73%
- B. Fastening system: Fabricated from steel sheets, diamond shaped to fit expanded steel mesh, press-molded screw hole to receive bugle-head drywall screws.
 - 1. Screws: ASTM C954; bugle head; self-drilling and self-tapping; M4 (#8) shank by enough length to penetrate steel framing by at least 10 mm (3/8 inch).

2.6 REQUIREMENTS:

- A. Welding in accordance with AWS D1.3

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- 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. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- F. Install headers in all openings that are larger than the stud spacing in that wall.
- G. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- H. Studs in one piece for their entire length, splices will not be permitted.
- I. Provide end blocking where joist ends are not restrained from rotation.

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- J. 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.
- K. Provide temporary bracing and leave in place until framing is permanently stabilized.
- L. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- M. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

3.3 STEEL MESH BLAST MITIGATION SHIELDING INSTALLATION

- A. Install steel mesh at exterior face of perimeter wall framing.
- B. Measure and cut steel mesh to overlap 2-1/2 inches.
- C. Fasten steel mesh to steel framing members using bugle head self-tapping screws and fastening clips at minimum 8 inches on center.

3.4 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.

3.5 FIELD REPAIR:

- A. Touch-up damaged galvanizing with galvanizing repair paint.

3.6 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

- - - E N D - - -

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: (12, 14A, 14C)
 - 2. Miscellaneous short wall supports

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Prime and finish painting: Section 09 91 00, PAINTING.
- D. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.
- E. Seismic bracing: Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

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. Ceiling hatch.
- 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.

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- 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):
 - 1. B18.6.1-81(R1997) Wood Screws
 - 2. B18.2.2-87(R2005) Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
 - 1. A36/A36M-05 Structural Steel
 - 2. A47-99(R2004) Malleable Iron Castings
 - 3. A48-03 Gray Iron Castings
 - 4. A53-06 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - 5. A123-02 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 6. A167-99(R2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - 7. A269-07 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
 - 8. A307-07 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - 9. A312/A312M-06 Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
 - 10. A391/A391M-01 Grade 80 Alloy Steel Chain

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11. A653/A653M-07 Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
 12. A786/A786M-05 Rolled Steel Floor Plate
 13. B221-06 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 14. B456-03 Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
 15. B632-02 Aluminum-Alloy Rolled Tread Plate
 16. C1107-07 Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 17. D3656-04 Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
 18. F436-07 Hardened Steel Washers
 19. F468-06 Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
 20. F593-02 Stainless Steel Bolts, Hex Cap Screws, and Studs
 21. F1667-05 Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
1. D1.1-04 Structural Welding Code Steel
 2. D1.2-03 Structural Welding Code Aluminum
 3. D1.3-98 Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
1. AMP521-01 Pipe Railing Manual
 2. AMP 500-505-1988 Metal Finishes Manual
 3. MBG 531-00 Metal Bar Grating Manual
 4. MBG 532-00 Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC):
1. SP 1-05 No. 1, Solvent Cleaning
 2. SP 2-05 No. 2, Hand Tool Cleaning
 3. SP 3-05 No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
1. 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.

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- B. Floor Plates, Covers, Trap Doors, Catwalks, and Platforms: 500 kg/m² (100 pounds per square foot).

2.2 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A167, 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. Steel Pipe: ASTM A53.
 - 1. Galvanized for exterior locations.
 - 2. Type S, Grade A unless specified otherwise.
 - 3. NPS (inside diameter) as shown.
- E. Primer Paint: As specified in Section 09 91 00, PAINTING.
- F. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- G. 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 with in 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.
- H. Grout: ASTM C1107, pourable type.

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.

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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

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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:

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- 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 (1 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 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.

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- 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.

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 Items not otherwise detailed:

- 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.
- 6. Provide supports for ceiling hung pilasters at dressing booths and entrance screen to toilet room similar to support for toilet stall pilasters.

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.

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4. Steel hat channels where shown. Flange cut and flattened 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.

2.6 GRATINGS

- A. Fabricate gratings to support live loads specified and a concentrated load as specified.
- B. Provide clearance at all sides to permit easy removal of grating.
- C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (1 inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.
- D. Fabricate in sections not to exceed 2.3 m² (25 square feet) in area and 90 kg (200 pounds) in weight.
- E. Fabricate sections of grating with end-banding bars.
- F. Fabricate angle frames and supports, including anchorage as shown.
 1. Fabricate intermediate supporting members from "T's" or angles.
 2. Locate intermediate supports to support grating section edges.
 3. Fabricate frame to finish flush with top of grating.
 4. Locate anchors at ends and not over 600 mm (24 inches) o.c.
 5. Butt or miter, and weld angle frame at corners.

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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. Supports for Wall Mounted items:

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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.

C. Support at Ceiling for 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.

D. 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.

E. 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.

F. 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.

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3.3 STEEL COMPONENTS FOR MILLWORK ITEMS

- A. Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

3.4 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.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 05 75 00

DECORATIVE FORMED METAL

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section Includes:
 - 1. Metal wall panels.
 - 2. Wall Letters

1.2 RELATED WORK

- A. Section 05 50 00 "Metal Fabrications" for non-decorative metal fabrications.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: For each type of product indicated. Include finishing materials.
- C. Shop Drawings: Show fabrication and installation details for decorative formed metal.
 - 1. Include plans, elevations, component details, and attachments to other work.
 - 2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.
- D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.
- E. Qualification Data: For qualified fabricator.
- F. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- G. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

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- B. Installer Qualifications: Fabricator of products.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.3, "Structural Welding Code - Sheet Steel."
 - 4. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.
- B. Store products on elevated platforms in a dry location.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS**2.1 SHEET METAL**

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. Provide materials without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Recycled Content of Metal Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ALUMINUM

- A. Aluminum, General: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties for each aluminum form required not less than that of alloy and temper designated below.
- B. Extruded Bars and Shapes: ASTM B 221, Alloy 6063-T5/T52.

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- C. Extruded Structural Pipe and Round Tubing: ASTM B 429/B 429M, Alloy 6063-T6.
- D. Drawn Seamless Tubing: ASTM B 210 or ASTM B 483/B 483M, Alloy 6063-T832.
- E. Plate and Sheet: ASTM B 209, Alloy 6061-T6.
- F. Die and Hand Forgings: ASTM B 247 , Alloy 6061-T6.
- G. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.3 STAINLESS STEEL

- A. Tubing: ASTM A 554, Grade MT 316 .
- B. Pipe: ASTM A 312/A 312M, Grade TP 316 .
- C. Sheet, Strip, Plate, and Flat Bar: ASTM A 666, Type 316 .
- D. Bars and Shapes: ASTM A 276, Type 316 .

2.4 FASTENERS

- A. Fastener Materials: Unless otherwise indicated, provide the following:
 - 1. Stainless-Steel Items: Type 316 stainless-steel fasteners.
 - 2. Uncoated-Steel Items: Plated steel fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating where concealed, Type 304 stainless-steel fasteners where exposed.
 - 3. Dissimilar Metals: Type 316 stainless-steel fasteners.
- B. Fasteners for Anchoring to Other Construction: Unless otherwise indicated, select fasteners of type, grade, and class required to produce connections suitable for anchoring indicated items to other types of construction indicated.
- C. Provide concealed fasteners for interconnecting components and for attaching decorative metal items to other work unless otherwise indicated.
 - 1. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
- E. Post-Installed Anchors: Torque-controlled expansion type or chemical type.

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1. Material Where Stainless Steel Is Indicated: Alloy Group 2 stainless-steel bolts, ASTM F 593 , and nuts, ASTM F 594 .

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.6 FABRICATION OF WALL LETTERS

- A. Dimensional Cutout Letters: Water jet cut aluminum letters with uniform faces, square cut, smooth edges, precisely formed lines and profiles as indicated on drawings.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of decorative formed metal.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Provide anchorage devices and fasteners where needed to secure decorative metal to in-place construction.
- B. Perform cutting, drilling, and fitting required to install decorative metal. Set products accurately in location, alignment, and elevation, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items to be built into concrete, masonry, or similar construction.
- C. Fit exposed connections accurately together to form tight, hairline joints or, where indicated, uniform reveals and spaces for sealants and joint fillers. Where cutting, welding, and grinding are required for proper shop fitting and jointing of decorative metal, restore finishes to eliminate evidence of such corrective work.
- D. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.
- E. Restore protective coverings that have been damaged during shipment or installation. Remove protective coverings only when there is no possibility of damage from other work yet to be performed at same location.

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1. Retain protective coverings intact; remove coverings simultaneously from similarly finished items to preclude nonuniform oxidation and discoloration.

- F. Field Welding: Comply with applicable AWS specification for procedures of manual shielded metal arc welding and requirements for welding and for finishing welded connections in "Fabrication, General" Article. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

3.3 ADJUSTING AND CLEANING

- A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.
- B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

- A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with General Contractor's Waste Management Plan and Section 01 74 19.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the General Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers.

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SECTION 06 10 00

ROUGH CARPENTRY

PART 1 - GENERAL

1.1 DESCRIPTION:

- A. Section specifies wood blocking, framing, sheathing, furring, nailers, sub-flooring, rough hardware, IT backboards and light wood construction.

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.
- C. Gypsum sheathing: Section 09 29 00, GYPSUM BOARD.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings showing framing connection details, fasteners, connections and dimensions.

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 150 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 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):

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1. National Design Specification for Wood Construction
 2. NDS-05 Conventional Wood Frame Construction
- C. American Institute of Timber Construction (AITC):
1. A190.1-07 Structural Glued Laminated Timber
- D. American Society of Mechanical Engineers (ASME):
1. B18.2.1-96(R2005) Square and Hex Bolts and Screws
 2. B18.2.2-87 Square and Hex Nuts
 3. B18.6.1-97 Wood Screws
 4. B18.6.4-98(R2005) Thread Forming and Thread Cutting Tapping Screws and Metallic Drive Screws
- E. American Plywood Association (APA):
1. E30-07 Engineered Wood Construction Guide
- F. American Society for Testing And Materials (ASTM):
1. A47-99(R2009) Ferritic Malleable Iron Castings
 2. A48-03(R2008) Gray Iron Castings
 3. A653/A653M-10 Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 4. C954-10 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
 5. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Metal Studs
 6. D143-09 Small Clear Specimens of Timber, Method of Testing
 7. D1760-01 Pressure Treatment of Timber Products
 8. D2559-10 Adhesives for Structural Laminated Wood Products for Use Under Exterior (Wet Use) Exposure Conditions
 9. D3498-11 Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems
 10. F844-07 Washers, Steel, Plan (Flat) Unhardened for General Use
 11. F1667-08 Nails, Spikes, and Staples
- G. Federal Specifications (Fed. Spec.):
1. MM-L-736C Lumber; Hardwood
- H. Commercial Item Description (CID):
1. A-A-55615 Shield, Expansion (Wood Screw and Lag Bolt Self Threading

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Anchors)

- I. Military Specification (Mil. Spec.):
 - 1. MIL-L-19140E Lumber and Plywood, Fire-Retardant Treated
- J. Truss Plate Institute (TPI):
 - 1. TPI-85 Metal Plate Connected Wood Trusses
- K. U.S. Department of Commerce Product Standard (PS)
 - 1. PS 1-95 Construction and Industrial Plywood
 - 2. PS 20-05 American Softwood Lumber Standard

PART 2 - PRODUCTS**2.1 LUMBER:**

- A. Unless otherwise specified, each piece of lumber bear grade mark, stamp, or other identifying marks indicating grades of material, and rules or standards under which produced.
 - 1. Identifying marks in accordance with rule or standard under which material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
 - 2. Inspection agency for lumber approved by the Board of Review, American Lumber Standards Committee, to grade species used.
- B. Lumber Other Than Structural:
 - 1. Unless otherwise specified, species graded under the grading rules of an inspection agency approved by Board of Review, American Lumber Standards Committee.
 - 2. Furring, blocking, nailers and similar items 100 mm (4 inches) and narrower Standard Grade; and, members 150 mm (6 inches) and wider, Number 2 Grade.
- C. Sizes:
 - 1. Conforming to Prod. Std., PS20.
 - 2. Size references are nominal sizes, unless otherwise specified, actual sizes within manufacturing tolerances allowed by standard under which produced.
- D. Moisture Content:
 - 1. At time of delivery and maintained at the site.
 - 2. Boards and lumber 50 mm (2 inches) and less in thickness: 19 percent or less.
 - 3. Lumber over 50 mm (2 inches) thick: 25 percent or less.

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E. Fire Retardant Treatment:

1. Mil Spec. MIL-L-19140 with piece of treated material bearing identification of testing agency and showing performance rating.
2. Treatment and performance inspection, by an independent and qualified testing agency that establishes performance ratings.

F. Preservative Treatment:

1. Do not treat Heart Redwood and Western Red Cedar.
2. Treat wood members and plywood exposed to weather or in contact with plaster, masonry or concrete, including framing of open roofed structures; sills, sole plates, furring, and sleepers that are less than 600 mm (24 inches) from ground; nailers, edge strips, blocking, crickets, curbs, cant, vent strips and other members used 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 ASTM D1760, except any process involving the use of Chromated Copper arsenate (CCA) for pressure treating wood is not permitted.

2.2 PLYWOOD

A. Comply with Prod. Std., PS 1.

- B. Bear the mark of a recognized association or independent inspection agency that maintains continuing control over quality of plywood which identifies compliance by veneer grade, group number, span rating where applicable, and glue type. Fire treated.

2.3 ROUGH HARDWARE AND ADHESIVES:

A. Anchor Bolts:

1. ASME B18.2.1 and ANSI B18.2.2 galvanized, 13 mm (1/2 inch) unless shown otherwise.
2. Extend at least 200 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. Use 13 mm (1/2 inch) bolt unless shown otherwise.

C. Washers:

1. ASTM F844.
2. Use zinc or cadmium coated steel or cast iron for washers exposed to weather.

D. Screws:

1. Wood to Wood: ANSI B18.6.1 or ASTM C1002.

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2. Wood to Steel: ASTM C954, or ASTM C1002.

PART 3 - EXECUTION**3.1 INSTALLATION OF FRAMING AND MISCELLANEOUS WOOD MEMBERS:****A. Fasteners:****1. Bolts:**

- a. Fit bolt heads and nuts bearing on wood with washers.
- b. Countersink bolt heads flush with the surface of nailers.
- c. Embed in concrete and solid masonry or use expansion bolts. Special bolts or screws designed for anchor to solid masonry or concrete in drilled holes may be used.
- d. Use toggle bolts to hollow masonry or sheet metal.
- e. Use bolts to steel over 2.84 mm (0.112 inch, 11 gage) in thickness. Secure wood nailers to vertical structural steel members with bolts, placed one at ends of nailer and 600 mm (24 inch) intervals between end bolts. Use clips to beam flanges.

2. Drill Screws to steel less than 2.84 mm (0.112 inch) thick.

- a. ASTM C1002 for steel less than 0.84 mm (0.033 inch) thick.
- b. ASTM C 954 for steel over 0.84 mm (0.033 inch) thick.

3. Power actuated drive pins may be used where practical to anchor to solid masonry, concrete, or steel.**4. Do not anchor to wood plugs or nailing blocks in masonry or concrete. Use metal plugs, inserts or similar fastening.****5. Screws to Join Wood:**

- a. Where shown or option to nails.
- b. ASTM C1002, sized to provide not less than 25 mm (1 inch) penetration into anchorage member.
- c. Spaced same as nails.

6. Installation of Timber Connectors:

- a. Conform to applicable requirements of the NFPA National Design Specification for Wood Construction.
- b. Fit wood to connectors and drill holes for fasteners so wood is not split.

B. Set sills or plates level in full bed of mortar on masonry or concrete walls.

1. Space anchor bolts 1200 mm (4 feet) on centers between ends and within 150 mm (6 inches) of end. Stagger bolts from side to side on plates over 175 mm (7 inches) in width.
2. Use shims of slate, tile or similar approved material to level wood members resting on concrete or masonry. Do not use wood shims or wedges.
3. Closely fit, and set to required lines.

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- C. Cut notch, or bore in accordance with NFPA Manual for House-Framing for passage of ducts wires, bolts, pipes, conduits and to accommodate other work. Repair or replace miscut, misfit or damaged work.
- D. Blocking Nailers, and Furring:
 - 1. Install furring, blocking, nailers, and grounds where shown.
 - 2. Use longest lengths practicable.
 - 3. Use 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 600 mm (24 inches) between ends.
 - c. Stagger nails from side to side of wood member over 125 mm (5 inches) in width.
 - 5. Fabricate roof edge vent strips with 6 mm by 6 mm (1/4 inch by 1/4 inch) notches, 100 mm (4 inches) on center, aligned to allow for venting of venting base sheet. Option: Texture 1-11 plywood with parallel grooves 100 mm (4 inches) o.c. may be used.
 - 6. Unless otherwise shown, use wall furring 25 mm by 75 mm (1 inch by 3 inch) continuous wood strips installed plumb on walls, using wood shims where necessary so face of furring forms a true, even plane. Space furring not over 400 mm (16 inches) on centers, butt joints over bearings and rigidly secure in place. Anchor furring on 400 mm (16 inches) centers.

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 06 20 00**FINISH CARPENTRY****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies exterior and interior millwork.
- B. Items specified.
 - 1. Solid Polymer Counter and other Work Tops
 - 2. Miscellaneous Millwork
 - 3. Provide custom plastic laminate panels at plastic laminate wall panel system.
 - 4. Architectural woodwork hardware and accessories.
 - 5. FRP decorative wall panels(**Alternate#6: Waiting Room Wall Protection**)

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- C. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- D. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.
- F. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 DEFINITIONS

- A. Exposed Surfaces: Visible surfaces of units when doors, drawers, or other closures are in closed position; visible exterior and interior surfaces of units without closures; visible surfaces behind clear glass doors; bottoms of units more than 4 feet above floor; closure fronts and edges; and countertops and splashes including their edges.
- B. Semi-Exposed Surfaces: Visible interior surfaces of units when doors are in open position; surfaces and edges of shelves; interior surfaces of doors and drawers; bottoms of wall hung units 1200 mm (4 feet) or less above floor; and tops of units 1650 mm (6 feet 6 inches) or more above floor.
- C. Concealed Surfaces: All surfaces other than exposed or semi-exposed

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as defined above.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Millwork items: Half full size scale for sections and details 1:50 (1/4-inch) for elevations and plans.
 - 2. Show construction and installation.
- C. Samples:
 - 1. Plastic laminate finished plywood or particleboard, 150 mm by 300 mm (six inches by twelve inches).
 - 2. FRP Decorative Wall Panels: Four samples of each color, 150 mm by 150 mm (6 by 6 inch),, for color and pattern verification.
- D. Certificates:
 - 1. Indicating preservative treatment and fire retardant treatment of materials meet the requirements specified.
 - 2. Indicating moisture content of materials meet the requirements specified.
- E. List of acceptable sealers for fire retardant and preservative treated materials.
- F. Manufacturer's literature and data:
 - 1. Finish hardware
 - 2. Sinks with fittings
 - 3. Electrical components

1.5 DELIVERY, STORAGE AND HANDLING

- A. Protect lumber and millwork from dampness, maintaining moisture content specified both during and after delivery at site.
- B. Store finishing lumber and millwork in weathertight well ventilated structures or in space in existing buildings designated by Contracting Officer's Representative. Store at a minimum temperature of 21 deg C (70 deg F) for not less than 10 days before installation.
- C. Pile lumber in stacks in such manner as to provide air circulation around surfaces of each piece.

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

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basic designation only.

- B. American Society of Testing and Materials (ASTM):
 - 1. A36/A36M-08 Structural Steel
 - 2. A53-07 Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless
 - 3. A167-99 (R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 4. B26/B26M-09 Aluminum-Alloy Sand Castings
 - 5. B221-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - 6. E84-09 Surface Burning Characteristics of Building Materials
- C. American Hardboard Association (AHA):
 - 1. A135.4-04 Basic Hardboard
- D. Builders Hardware Manufacturers Association (BHMA):
 - 1. A156.9-03 Cabinet Hardware
 - 2. A156.11-04 Cabinet Locks
 - 3. A156.16-02 Auxiliary Hardware
- E. Hardwood Plywood and Veneer Association (HPVA):
 - 1. HP1-09 Hardwood and Decorative Plywood
- F. National Particleboard Association (NPA):
 - 1. A208.1-99 Wood Particleboard
- G. American Wood-Preservers' Association (AWPA):
 - 1. AWPA C1-03 All Timber Products - Preservative Treatment by Pressure Processes
- H. Architectural Woodwork Institute (AWI):
 - 1. AWI-99 Architectural Woodwork Quality Standards and Quality Certification Program
- I. National Electrical Manufacturers Association (NEMA):
 - 1. LD 3-05 High-Pressure Decorative Laminates
- J. U.S. Department of Commerce, Product Standard (PS):
 - 1. PS20-05 American Softwood Lumber Standard
- K. Military Specification (Mil. Spec):
 - 1. MIL-L-19140E Lumber and Plywood, Fire-Retardant Treated

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L. Federal Specifications (Fed. Spec.):

1. A-A-1922A Shield Expansion
2. A-A-1936 Contact Adhesive
3. FF-N-836D Nut, Square, Hexagon Cap, Slotted, Castle
4. FF-S-111D(1) Screw, Wood
5. MM-L-736(C) Lumber, Hardwood

PART 2 - PRODUCTS**2.1 LUMBER**

A. Grading and Marking:

1. Lumber shall bear the grade mark, stamp, or other identifying marks indicating grades of material.
2. Such identifying marks on a material shall be in accordance with the rule or standard under which the material is produced, including requirements for qualifications and authority of the inspection organization, usage of authorized identification, and information included in the identification.
3. The inspection agency for lumber shall be approved by the Board of Review, American Lumber Standards Committee, to grade species used.

B. Sizes:

1. Lumber Size references, unless otherwise specified, are nominal sizes, and actual sizes shall be within manufacturing tolerances allowed by the standard under which product is produced.
2. Millwork, standing and running trim, and rails: Actual size as shown or specified.

C. Hardwood: MM-L-736, species as specified for each item.

D. Softwood: PS-20, exposed to view appearance grades:

1. Use C select or D select, vertical grain for transparent finish including stain transparent finish.
2. Use Prime for painted or opaque finish.

E. Use edge grain Wood members exposed to weather.

2.2 PLYWOOD

A. Softwood Plywood:

1. Prod. Std.
2. Grading and Marking:
 - a. Each sheet of plywood shall bear the mark of a recognized

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association or independent inspection agency that maintains continuing control over the quality of the plywood.

- b. The mark shall identify the plywood by species group or identification index, and shall show glue type, grade, and compliance with PS1.
- c. Fire Retardant Treated for exposed IT Backboards
- 3. Plywood, 13 mm (1/2 inch) and thicker; not less than five ply construction, except 32 mm (1-1/4 inch) thick plywood not less than seven ply.
- 4. Shelving Plywood:
 - a. Interior Type, any species group.
 - b. Veneer Grade: A-B or B-C.
- 5. Other: As specified for item.

B. Hardwood Plywood:

- 1. HPVA: HP.1
- 2. Species of face veneer shall be as shown or as specified in connection with each particular item.
- 3. Inside of Building:
 - a. Use Type II (interior) A grade veneer for transparent finish.
 - b. Use Type II (interior) Sound Grade veneer for paint finish.
- 4. On Outside of Building:
 - a. Use Type I, (exterior) A Grade veneer for natural or stained and varnish finish.
 - b. Use Type I, (exterior) Sound Grade veneer for paint finish.
- 5. Use plain sliced rotary cut white birch unless specified otherwise.

2.3 PLASTIC LAMINATES

- 1. Plastic Laminates:
 - a. Types: NEMA LD-3.1 high pressure laminates.
 - 1. Horizontal Surfaces: General Purpose Type, nominal 0.050".
 - 2. Vertical Surfaces: Vertical Surface Type, nominal 0.032".
 - 3. Unexposed Surfaces: Balanced with 0.030" melamine backing sheet unless noted otherwise.
 - Colors: As indicated
- 2. Plastic Laminate Finished Casework and Custom Panels at Plastic Laminate Wall Panel Systems (in Section 09 77 50)
 - a. Quality: AWS/Premium Grade Type A frameless, Style 1 - Overlay, flush overlay.
 - 1. Special: Provide each single length section of casework in largest such sections as access and openings allow, formerly WI Type II.

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- i. Multiple self-supporting units fastened together to form larger unit allowed only where access and openings do not allow single length sections.3. Unexposed Surfaces: Balanced with 0.030" melamine backing sheet unless noted otherwise.
 - ii. Doors: Provide plastic laminate finish on both exterior and interior surfaces and all four edges; melamine is not acceptable for interior of doors.
- 3. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.
- 4. FRP Decorative Wall Panels: Plastic laminate with fiberglass reinforced backing meeting the following requirements:
 - a. Nominal Thickness: 2.3mm (0.09 inch).
 - b. Flexural Strength, ASTM D790: 70 MPa (10,000 psi).
 - c. Flexural Modulus, ASTM D790: 2724 MPa (500,000 psi).
 - d. Tensile Strength, ASTM D638: 77 MPa (8,000 psi).
 - e. Tensile Modulus, ASTM D638: 7888 MPa (600,000 psi).
 - f. Barcol Hardness, ASTM D2583: 30-40.
 - g. Izod Impact, ASTMD256: 0.19J/mm (6.8ft-lbs/in.).
 - h. Gardner Impact, ASTM D5420: 6.78 J (60 in-lbs).
 - i. Surface Burning Characteristics, ASTM E84: Class C (Flame Spread less than 200, Smoke Development less than 450).
 - j. Taber Abrasion, percent loss (25 cycles CS17 wheel, 1000g): 0.008 percent.

2.4 SOLID SURFACE FOR COUNTERTOPS

- 1. Solid Polymer Countertops: Manufacturer's standard polymer system with color throughout thickness; provide manufacturer recommended joint adhesive; exposed surfaces finished to match top; with integral sinks.
 - a. Quality: AWS/Premium Grade.
 - d. Color: See section 09 06 00

2.5 PARTICLEBOARD

- A. NPA A208.1
- B. Plastic Laminate Particleboard Cores:
 - 1. Use Type 1, Grade 1-M-3, or Type 2, Grade 2-M-2, unless otherwise specified.
 - 2. Use Type 2, Grade 2-M-2, exterior bond, for tops with sinks.
- C. General Use: Type 1, Grade 1-M-3 or Type 2, Grade 2-M-2.

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2.6 ADHESIVE

- A. For Interior Millwork: Unextended urea resin, unextended melamine resin, phenol resin, or resorcinol resin.

2.7 MISSC. STEEL SUPPORTS

- A. Miscellaneous Steel Supports: Meet requirements of Section 05500, METAL FABRICATIONS for materials, fabrication, and finishing.
All Support Steel brackets to be Flush concealed in wall type.
- B. Stainless Steel Plate: ASTM A167.
- C. Aluminum Channel Trim: Extruded aluminum shapes in configurations as indicated on Drawings with clear anodized finish.
- D. Fasteners:
 - 1. Lag Bolts: Fed. Spec. FF-B-561.
 - 2. Bolts with Nuts: Fed. Spec. FF-B-575 and FF-N-836.
 - 3. Toggle Bolts: Fed. Spec. FF-B-588, Type I, Class A, Style 1.
 - 4. Nails: Fed. Spec. FF-N-105, Type II, Style 6 or 14 for finish work.
 - 5. Power Actuated Pins: Fed. Spec. FF-P-395.
 - 6. Expansion Bolts: Fed. Spec. FF-S-325, Group II, type 1 or 2.
 - 7. Screws: Fed. Spec. FF-S-111.
 - 8. Washers: ASTM F436.

2.8 CASEWORK HARDWARE

- A. Casework Hardware: Provide casework hardware items as required for complete installation as indicated; provide types as listed in Architectural Woodwork Standards for Grade 1, but no less than following types.
 - 1. Adjustable Shelf Standards and Supports: surface type steel standards and steel shelf brackets with epoxy powder coat finish; BHMA A156.9 B04102 and 04112.
 - 2. Concealed Cabinet Hinges: BHMA A156.9 B01602 or B01603 frameless European concealed type, minimum 160 degree opening, with spring closer.
 - 3. Corner Hinge with Exposed Axle: 4mm with 15mm overlay arm, BHMA A156.9, Grade 1, 270 degree opening, self closing.
 - 4. Invisible Hinges where specified, 220 stainless steel.
 - 5. Cabinet Pulls: Recessed anodized aluminum with clear lacquer finish, See Section 09 06 00 for Pull types.
- B. Cabinet Locks: Pin and tumbler slide bolt lock with five pin tumblers as approved by Architect, two keys each.
- C. Drawer Slides: Side mounted epoxy coated steel, self-closing, designed to prevent rebound when drawers are closed, BHMA A156.9, Type B05091.

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- D. Provide Grade 1HD-100 for drawers not more than 6" high and 24" wide.
- E. Provide Grade 1HD-200 for drawers more than 6" high or 24" wide.
- F. Provide Heavy Duty Grade 1HD-100 and 1HD-200 full overtravel extension ball bearing type where indicated.
- G. Flush In-wall Counter Supports: Anchor to structure and countertops according to manufacturer installation instructions for size, spacing, and type of screw.
- H. Grommets for Cable Passage through Countertops
- I. Label Frame: At all cabinets and drawers unless otherwise indicated.
- J. Aluminum Shapes: Attached to casework, wood veneer panels and other work as indicated; custom roll and stretch formed; curved shapes where indicated
- K. Underdesk Keyboard Tray: Keyboard tray with adjustable tilt plate, full extension ball bearing slide, integral keyboard tray including gel palm rest, cable management and mouse pad.

2.9 FABRICATION

A. General:

- 1. Except as otherwise specified, use AWI Premium Grade for architectural woodwork and interior millwork.
- 2. Finish woodwork shall be free from pitch pockets.
- 3. Except where special profiles are shown, trim shall be standard stock molding and members of the same species.
- 4. Plywood shall be not less than 13 mm (1/2 inch), unless otherwise shown or specified.
- 5. Edges of members in contact with concrete or masonry shall have a square corner caulking rebate.
- 6. Fabricate members less than 4 m (14 feet) in length from one piece of lumber, back channeled and molded as shown.
- 7. Interior trim and items of millwork to be painted may be fabricated from jointed, built-up, or laminated members, unless otherwise shown on drawings or specified.
- 8. Plastic Laminate Work:
 - a. Factory glued to either a plywood or a particle board core, thickness as shown or specified.
 - b. Cover exposed edges with plastic laminate, except where aluminum or stainless steel strips are shown or specified.
 - c. Provide plastic backing sheet on underside of countertops, vanity tops, thru-wall counter and sills including back splashes and end splashes of countertops.
 - d. Use backing sheet on concealed large panel surface when

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decorative face does not occur.

B. Plastic Laminate Counter or Work Tops:

1. Fabrication with plastic laminate over 32 mm (1-1/4 inch) thick core unless shown otherwise.
 - a. Use decorative laminate for exposed edges of tops 38 mm (1-1/2 inches) wide and on back splash and end splash. Use metal edges for top edges less than 38 mm (1-1/2 inches) wide.
 - b. Assemble back splash and end splash to counter top.
 - c. Use one piece counters for straight runs.
 - d. Miter corners for field joints with overlapping blocking on underside of joint.

2. Solid Surface Counters.

Countertops: Provide maximum sizes available. Locate butt joints at least 2'-0" from cutouts where more than one piece countertops are required.

- a. Make corners and joints hairline; slightly bevel arises.
- b. Provide cutouts for inserts, electrical and security fixtures and fittings; verify locations from on-site dimensions.
- c. Splashes and edges as indicated.

PART 3 - EXECUTION

3.1 ENVIRONMENTAL REQUIREMENTS

- A. Maintain work areas and storage areas to a minimum temperature of 21 deg C (70 deg F) for not less than 10 days before and during installation of interior millwork.
- B. Do not install finish lumber or millwork in any room or space where wet process systems such as concrete, masonry, or plaster work is not complete and dry.

3.2 INSTALLATION

A. General:

1. Millwork receiving transparent finish shall be primed and back-painted on concealed surfaces. Set no millwork until primed and back-painted.
2. Secure trim with fine finishing nails, screws, or glue as required.
3. Set nails for putty stopping. Use washers under bolt heads where no other bearing plate occurs.
4. Seal cut edges of preservative and fire retardant treated wood materials with a certified acceptable sealer.

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5. Coordinate with plumbing and electrical work for installation of fixtures and service connections in millwork items.
6. Plumb and level items unless shown otherwise.
7. Nail finish at each blocking, lookout, or other nailer and intermediate points; toggle or expansion bolt in place where nails are not suitable.

B. Pegboard or Perforated Hardboard:

1. Install board with chromium plated steel round-head toggle bolts or other fasteners capable of supporting board when loaded at 122 kg/m² (25 psf) of board.
2. Install board with spacers to allow hooks and accessories to be inserted and removed.
3. Install 6 mm (1/4 inch) round trim at perimeter to finish flush with face of board and close space between wall and hardboard.

C. Wall Paneling:

1. Solid hardwood boards
 - a. Install 25 by 75 mm (1 by 3 inch) furring strips on 400 mm (16 inch) centers horizontally between top and bottom strips. Secure to each stud with two screws.
 - b. Install paneling laid vertically with end joints staggered between adjacent boards.
 - c. Tightly butt joints and blind nail each board at each furring strip.
2. Install edge trim and base as shown, use solid wood members of same species as wall paneling.
3. Plywood paneling:
 - a. Install 25 by 75 mm (1 by 3 inch) furring strips horizontally, under end joints of plywood and 300 mm (16 inches) on center between end strips. Install cross furring strips centered vertically at side joints of plywood paneling less than 13 mm (1/2 inch) thick. Secure to each stud with two screws.
 - b. Install panels with long edge vertically and end joints aligned where exposed to view.
 - c. Align V-grooves where end joints meet and maintain continuity of pattern.
 - d. Apply adhesive to each furring strip so that panel is bonded to furring strip in continuous bead of adhesive in accordance with adhesive manufacturers specifications.
 - e. Nailing:
 - 1) Nail in V-grooves to horizontal furring strips and at panel edges and within 25 mm (1 inch) of ends except within 50 mm (2 inches) of end when panel end abutts other surfaces. Do not space nails in V-grooves over 150 mm (6 inches), on center.
 - 2) Nail ungrooved panels at 400 mm (16 inches) centers to

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horizontal furring strips between end or edge nails. Set nails and fill hole with filler to match wood panel for panels thicker than 13 mm (1/2 inch). Set nails flush with surface of panel thinner than 13 mm (1/2 inch).

- 3) Use colored nails matching panel finish for prefinished panels or panels less than 13 mm (1/2 inch) thick.

D. Shelves:

1. Install mounting strip at back wall and end wall for shelves in closets where shown secured with toggle bolts at each end and not over 600 mm (24 inch) centers between ends.
 - a. Nail Shelf to mounting strip at ends and to back wall strip at not over 900 mm (36 inches) on center.
 - b. Install metal bracket, ANSI A156.16, B04041, not over 1200 mm (4 feet) centers when shelves exceed 1800 mm (6 feet) in length.
 - c. Install metal bracket, ANSI A156.16, B04051, not over 1200 mm (4 feet) on centers where shelf length exceeds 1800 mm (6 feet) in length with metal rods, clothes hanger bars ANSI A156.16, L03131, of required length, full length of shelf.
2. Install vertical slotted shelf standards, ANSI A156.9, B04103 to studs with toggle bolts through each fastener opening. Double slotted shelf standards may be used where adjacent shelves terminate.
 - a. Install brackets ANSI A156.9, B04113, providing supports for shelf not over 900 mm (36 inches) on center and within 13 mm (1/2 inch) of shelf end unless shown otherwise.
 - b. Install shelves on brackets so front edge is restrained by bracket.

- E. Install with butt joints in straight runs and miter at corners.

3.3 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

- - - E N D - - -

SECTION 07 01 50.19
PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Roof partial roof tear-off, temporary roofing membrane on existing construction in preparation to receive new roofing membrane.
- B. Existing Membrane Roofing System: Built-up asphalt with related insulation, surfacing, and components and accessories between deck and roofing membrane.

1.2 RELATED WORK

- A. Use of the premises and phasing requirements: Section 01 00 00 GENERAL REQUIREMENTS.
- B. Temporary construction and environmental-protection measures for reroofing preparation: Section 01 00 00 GENERAL REQUIREMENTS
- C. HVAC equipment removal and reinstallation: Division 23 sections.
- D. Electrical equipment disconnection and reconnection: Division 26 sections.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
 - ANSI/SPRI FX-1-01(R2006) Standard Field Test Procedure for
Determining the Withdrawal Resistance of
Roofing Fasteners.
- C. ASTM International (ASTM):
 - C208-08.....Cellulosic Fiber Insulating Board
 - C728-05.....Perlite Thermal Insulation Board
 - C1177/C1177M-08.....Standard Specification for Glass Mat Gypsum
Substrate for Use as Sheathing
 - C1278/C1278M-07.....Standard Specification for Fiber-Reinforced
Gypsum Panel
 - D1079-09.....Standard Terminology Relating to Roofing and
Waterproofing

4470-10.....	Approved Standard for Class 1 Roof Coverings
1-28-09.....	Loss Prevention Data Sheet: Design Wind Loads.
1-29-09.....	Loss Prevention Data Sheet: Above-Deck Roof Components
1-49-09.....	Loss Prevention Data Sheet: Perimeter Flashing

1.4 MATERIALS OWNERSHIP

- ## 1.5 DEFINITIONS

- ## 1.6 QUALITY CONTROL

- Issued for Bidding
March 7, 2016

1.7 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Recover boards.
- C. List of proposed infill materials.
- D. List of proposed temporary roofing materials.
- E. Fastener pull-out test report.
- F. Photographs or Videotape: Document existing conditions of adjacent construction including site improvements.
- G. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a licensed landfill facility.
- H. Qualification Data: For Installer.
 - 1. Certificate indicating Installer is licensed to perform asbestos abatement.
 - 2. Certificate indicating Installer is approved by warrantor of existing roofing system.

1.8 PROJECT CONDITIONS

- A. Owner will occupy portions of building below reroofing area. Conduct reroofing so Owner's operations will not be disrupted.
 - 1. Coordinate work activities daily with Owner.
 - 2. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
- B. Protect building and landscaping from damage.
- C. Maintain access to existing walkways and adjacent occupied facilities.
- D. Weather Limitations: Proceed with reroofing preparation only when weather conditions permit Work to proceed without water entering existing roofing system or building.
- E. Hazardous Materials: A report on the presence of hazardous materials is available to Contractor for review and use.
 - 1. Examine report to become aware of locations where hazardous materials are present.
 - 2. Hazardous material remediation is specified elsewhere in the Contract Documents.

1.9 WARRANTY

- A. Warrant patched areas for a period of 10 years.

PART 2 - PRODUCTS

2.1 INFILL MATERIALS

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

2.2 TEMPORARY ROOFING MATERIALS

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

2.3 AUXILIARY REROOFING MATERIALS

- A. General: Auxiliary reroofing preparation materials recommended by roofing system manufacturer and compatible with components of existing and new membrane roofing system.
- B. Base Sheet Fasteners: Capped head, factory-coated steel fasteners, listed in FM Approval's "RoofNav."
- C. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07 60 00 SHEET METAL FLASHING AND TRIM.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect existing membrane roofing system that is indicated not to be reroofed.
 - 1. Limit traffic and material storage to areas of existing roofing membrane that have been protected.
 - 2. Maintain temporary protection and leave in place until replacement roofing has been completed. Remove temporary protection on completion of reroofing.
- B. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.
 - 1. Comply with Owner's requirements for maintaining fire watch when temporarily disabling smoke detectors.
- C. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
- D. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for

this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

1. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new membrane roofing system, provide alternative drainage method to remove water and eliminate ponding.
2. Do not permit water to enter into or under existing membrane roofing system components that are to remain.

E. Verify that rooftop utilities and service piping have been shut off before beginning the Work.

3.2 ROOF TEAR-OFF

- A. General: Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.
- B. Remove aggregate ballast from roofing membrane. Store aggregate ballast for reuse.
- C. Remove loose aggregate from aggregate-surfaced built-up bituminous roofing using a power broom.
- D. Remove accessories from roofing membrane.
- E. Partial Roof Tear-Off: Where indicated, remove existing roofing membrane and other membrane roofing system components down to the deck.
 1. Remove cover boards, roof insulation as required

3.3 DECK PREPARATION

- A. Inspect deck after tear-off or partial tear-off of membrane roofing system.
- B. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263. Do not proceed with roofing work if moisture condenses under the plastic sheet.
- D. If deck surface is not suitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect-Engineer. Do not proceed with installation until directed by Architect-Engineer.

3.4 INFILL MATERIALS INSTALLATION

- A. Immediately after removal of selected portions of existing membrane roofing system, and inspection and repair, if needed, of deck, fill in

the tear-off areas to match existing membrane roofing system construction.

1. Installation of infill materials is specified in Section 07 22 00, ROOF AND DECK INSULATION.
2. Install new roofing membrane patch over roof infill area. If new roofing membrane is installed the same day tear-off is made, roofing membrane patch is not required.

3.5 EXISTING BASE FLASHINGS

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

3.6 FASTENER PULL-OUT TESTING

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

3.7 RECOVER BOARD INSTALLATION

- A. Install recover boards over roof insulation with long joints in continuous straight lines and end joints staggered between rows. Loosely butt recover boards together and fasten to deck.
 1. Install additional fasteners near board corners and edges as necessary to conform boards to substrate and to adjacent boards.

3.8 DISPOSAL

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

SECTION 07 21 13**THERMAL INSULATION****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies thermal and acoustical insulation for buildings.
- B. Acoustical insulation is identified by thickness and words "Acoustical Insulation".

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Safing insulation: Section 07 84 00, FIRESTOPPING.

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. Insulation, each type used
 - 2. Adhesive, each type used.
 - 3. Tape
- C. Certificates: Stating the type, thickness and "R" value (thermal resistance) of the insulation to be installed.

1.4 STORAGE AND HANDLING:

- A. Store insulation materials in weathertight enclosure.
- B. Protect insulation from damage from handling, weather and construction operations before, during, and after installation.

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 basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. C270-08 Mortar for Unit Masonry
 - 2. C516-08 Vermiculite Loose Fill Thermal Insulation

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3. C549-06 Perlite Loose Fill Insulation
4. C552-07 Cellular Glass Thermal Insulation.
5. C553-08 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
6. C578-08 Rigid, Cellular Polystyrene Thermal Insulation
7. C591-08 Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
8. C612-04 Mineral Fiber Block and Board Thermal Insulation
9. C665-06 Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
10. C728-05 Perlite Thermal Insulation Board
11. C954-07 Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Base to Steel Studs From 0.033 (0.84 mm) inch 0.112 inch (2.84 mm) in thickness
12. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
13. D312-00(R2006) Asphalt Used in Roofing
14. E84-08 Surface Burning Characteristics of Building Materials
15. F1667-05 Driven Fasteners: Nails, Spikes and Staples.

PART 2 - PRODUCTS**2.1 INSULATION - GENERAL:**

- A. Where thermal resistance ("R" value) is specified or shown for insulation, the thickness shown on the drawings is nominal. Use only insulation with actual thickness that is not less than that required to provide the thermal resistance specified.
- B. Where "R" value is not specified for insulation, use the thickness shown on the drawings.
- C. Where more than one type of insulation is specified, the type of insulation for each use is optional, except use only one type of insulation in any particular area.
- D. Insulation Products shall comply with following minimum content standards for recovered materials:

Material Type	Percent by Weight
Perlite composite board	23 percent post consumer recovered paper
Polyisocyanurate/polyurethane	

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Rigid foam	9 percent recovered material
Foam-in-place	5 percent recovered material
Glass fiber reinforced	6 percent recovered material
Phenolic rigid foam	5 percent recovered material
Rock wool material	75 percent recovered material

The minimum-content standards are based on the weight (not the volume) of the material in the insulating core only.

2.2 EXTERIOR FRAMING OR FURRING INSULATION:

- A. Batt or Blanket: Optional.
- B. Mineral Fiber: ASTM C665, Type II, Class C, Category I where framing is faced with gypsum board.

2.3 RIGID INSULATION (EXTERIOR CONTINUOUS INSULATION)

- A. Foil-Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I, Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Thickness: 25 mm (1 inch).

2.4 ACOUSTICAL INSULATION:

- A. Mineral Fiber Batt or Blankets: ASTM C665. Maximum flame spread of 25 and smoke development of 450 when tested in accordance with ASTM E84.
- B. Thickness as shown; of widths and lengths to fit tight against framing.

2.5 RIGID INSULATION:

- A. On the inside face of exterior walls, spandrel beams, floors, and where shown.
- B. Mineral Fiber Board: ASTM C612, Type IB or 2.

2.6 FASTENERS:

- A. Staples or Nails: ASTM F1667, zinc-coated, size and type best suited for purpose.
- B. Screws: ASTM C954 or C1002, size and length best suited for purpose with washer not less than 50 mm (2 inches) in diameter.
- C. Impaling Pins: Steel pins with head not less than 50 mm (2 inches) in diameter with adhesive for anchorage to substrate. Provide impaling pins of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

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2.7 TAPE:

- A. Pressure sensitive adhesive on one face.
- B. Perm rating of not more than 0.50.

PART 3 - EXECUTION**3.1 INSTALLATION - GENERAL**

- A. Install insulation with the vapor barrier facing the heated side, unless specified otherwise.
- B. Install rigid insulating units with joints close and flush, in regular courses and with cross joints broken.
- C. Install batt or blanket insulation with tight joints and filling framing void completely. Seal cuts, tears, and unlapped joints with tape.
- D. Fit insulation tight against adjoining construction and penetrations, unless specified otherwise.

3.2 EXTERIOR FRAMING OR FURRING BLANKET INSULATION:

- A. Pack insulation around door frames and windows and in building expansion joints, door soffits and other voids. Pack behind outlets around pipes, ducts, and services encased in walls. Open voids are not permitted. Hold insulation in place with pressure sensitive tape.
- B. Lap vapor retarder flanges together over face of framing for continuous surface. Seal all penetrations through the insulation.
- C. Fasten blanket insulation between metal studs or framing and exterior wall furring by continuous pressure sensitive tape along flanged edges.
- D. Fasten blanket insulation between wood studs or framing with nails or staples through flanged edges on face of stud. Space fastenings not more than 150 mm (6 inches) apart.

3.3 ACOUSTICAL INSULATION:

- A. Fasten blanket insulation between metal studs and wall furring with continuous pressure sensitive tape along edges or adhesive.
- B. Pack insulation around door frames and windows and in cracks, expansion joints, control joints, door soffits and other voids. Pack behind outlets, around pipes, ducts, and services encased in wall or partition. Hold insulation in place with pressure sensitive tape or adhesive.
- C. Do not compress insulation below required thickness except where embedded items prevent required thickness.
- D. Where acoustical insulation is installed above suspended ceilings install

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blanket at right angles to the main runners or framing. Extend insulation over wall insulation systems not extending to structure above.

- E. Where semirigid insulation is used which is not full thickness of cavity, adhere to one side of cavity maintaining continuity of insulation and covering penetrations or embedments in insulation.

3.4 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 07 22 00**ROOF AND DECK INSULATION****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Roof and deck insulation, and cover board on new construction/patched areas ready to receive roofing or waterproofing membrane.
- B. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- C. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Roofing Section.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American Society of Heating, Refrigeration and Air Conditioning (ASHRAE):
 - 1. 90.1-07 Energy Standard for Buildings Except Low-Rise Residential Buildings
- C. ASTM International (ASTM):
 - 1. C208-08 Cellulosic Fiber Insulating Board
 - 2. C552-07 Cellular Glass Thermal Insulation
 - 3. C726-05 Mineral Fiber Roof Insulation Board
 - 4. C728-05 Perlite Thermal Insulation Board
 - 5. C1177/C1177M-08 Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing
 - 6. C1278/C1278M-07 Standard Specification for Fiber-Reinforced Gypsum Panel

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- 7. C1289-10 Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
- 8. C1396/C1396M-09 Standard Specification for Gypsum Board
- 9. D41-05 Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing
- 10. D312-06 Asphalt Used in Roofing
- 11. D1970-09 Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
- 12. D2178-04 Asphalt Glass Felt Used in Roofing and Waterproofing
- 13. D2822-05 Asphalt Roof Cement
- 14. D4586-07 Standard Specification for Asphalt Roof Cement, Asbestos-Free
- 15. E84-09 Standard Test Method for Surface Burning Characteristics of Building Material
- 16. F1667-05 Driven Fasteners: Nails, Spikes, and Staples
- D. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
 - 1. 4450-89 Approved Standard for Class 1 Insulated Steel Deck Roofs
 - 2. 4470-10 Approved Standard for Class 1 Roof Coverings
 - 3. 1-28-09 Loss Prevention Data Sheet: Design Wind Loads.
 - 4. 1-29-09 Loss Prevention Data Sheet: Above-Deck Roof Components
 - 5. 1-49-09 Loss Prevention Data Sheet: Perimeter Flashing
- E. National Roofing Contractors Association: Roofing and Waterproofing Manual
- F. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog, www.biopreferred.gov
- G. Underwriters Laboratories, Inc. (UL): Fire Resistance Directory (2009)
- H. U.S. Department of Commerce National Institute of Standards and Technology (NIST):
 - 1. DOC PS 1-09 U.S. Product Standard for Construction and Industrial Plywood
 - 2. DOC PS 2-04 Performance Standard for Wood-Based Structural-Use Panels.

1.4 PERFORMANCE REQUIREMENTS

- A. Thermal Performance: Provide roof insulation meeting minimum overall average R-value of 33 with minimum R-value at any location of 10.

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- B. FM Approvals: Provide roof insulation complying with requirements in FM Approvals 4450 and 4470 as part of specified roofing system, listed in FM Approvals "RoofNav" as part of roofing system meeting Fire/Windstorm Classification in Division 07 roofing section.

1.5 QUALITY CONTROL

- A. Requirements of Division 07 roofing section for qualifications of roofing system insulation Installer; Work of this Section shall be performed by same Installer.
- B. Requirements of Division 07 roofing section for inspection of Work of this Section and qualifications of Inspector.
- C. Unless specified otherwise, comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to insulation for storage, handling, and application.
- D. Requirements of roofing system uplift pressure design for specified roofing system.
- E. Requirements of applicable FM Approval for specified roofing system insulation attachment.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data:
 - 1. Roof insulation, each type.
 - 2. Cover board, each type.
 - 3. Fastening requirements.
 - 4. Insulation span data for flutes of metal decks.
- C. LEED and Federal Sustainable Design Submittals:
 - 1. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 2. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- D. Shop Drawings: Include plans, sections, details, and attachments.
 - 1. Nailers, cants, and terminations.
 - 2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.
- E. Samples:

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

F. Certificates:

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

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

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications. Qualifications shall include 5 years experience on similar projects and inspector shall be from accredited roofing organization.

1.7 DELIVERY, STORAGE AND MARKING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation requirements.

1.8 QUALITY ASSURANCE:

- A. Roof insulation on combustible or steel decks shall have a flame spread rating not greater than 75 and a smoke developed rating not greater than 150, exclusive of covering, when tested in accordance with ASTM E84, or shall have successfully passed FM Approvals 4450.
 1. Insulation bearing the UL label and listed in the UL Building Materials Directory as meeting the flame spread and smoke developed ratings will be accepted in-lieu-of copies of test reports.
 2. Compliance with flame spread and smoke developed ratings will not be required when insulation has been tested as part of a roof construction assembly of the particular type used for this project and the construction is listed as fire-classified in the UL Building Materials Directory or listed as Class I roof deck construction in the FM Approvals "RoofNav."
 3. Insulation tested as part of a roof construction assembly shall bear UL or FM labels attesting to the ratings specified herein.

PART 2 - PRODUCTS**2.1 ROOF AND DECK INSULATION**

- A. Roof and Deck Insulation, General: Preformed roof insulation boards approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2,

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felt or glass-fiber mat facer on both major surfaces.

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. Slope: As indicated on the Drawings.

2.2 INSULATION ACCESSORIES

A. Cover Board:

- B. Glass-mat, water-resistant gypsum substrate, ASTM C1177/C1177M, 6 mm (1/4 inch thick, factory primed).

2.3 FASTENERS

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening substrate board to roof deck.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SUBSTRATE BOARD INSTALLATION

- A. Fasten substrate board to top flanges of steel deck to resist uplift pressures according to roofing system manufacturer's instructions and requirements of FM Approvals listing for specified roofing system.

3.4 RIGID INSULATION INSTALLATION

A. Insulation Installation, General:

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

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4. Cant Strips: Install at junctures of roofing system with vertical construction.
 5. 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. Actual thickness shall provide the average thermal resistance "R" value of not less than that specified in Performance Requirements Article.
 2. Insulation on Metal Decks: Provide minimum thickness of insulation for metal decks recommended by the insulation manufacturer to span rib opening (flute size) of metal deck used. Support edges of insulation on metal deck ribs.
 3. When thickness of insulation to be used is more or less than that shown on the drawings, make adjustments in the alignment and location of roof drains, flashing, gravel stops, fascias and similar items at no additional cost to the Government.
 4. Where tapered insulation is used, the thickness of the insulation at high points and roof edges shall be as shown on the drawings; the thickness at the low point (drains) shall be not less than 38 mm (1-1/2 inches).
 5. Use not less than two layers of insulation when insulation is 68 mm (2.7 inch) or more in thickness unless specified otherwise. Stagger joints minimum 150 mm (6 inches).
- C. Lay insulating units with close joints, in regular courses and with cross joints broken. When laid in more than one layer, break joints of succeeding layers of roof insulation with those in preceding layer.
- D. Lay units with long dimension perpendicular to the rolled (longitudinal) direction of the roofing felt.
- E. Seal all cut edges at penetrations and at edges against blocking with bitumen or roof cement.
- F. Cut to fit tight against blocking or penetrations.
- G. Cover all insulation installed on the same day; comply with temporary protection requirements of Division 07 roofing section.
- H. Installation Method:
1. Mechanically Fastened Insulation:
 - a. Fasten insulation in accordance with FM Approval's "RoofNav" requirement in Division 07 roofing section.
 - b. Fasten insulation to resist uplift pressures specified in Division 07 roofing section.
 2. Cover Board: Install cover boards over insulation with long joints in continuous straight lines with staggered end joints. Offset cover board joints from insulation joints minimum 150 mm (6 inches). Fasten cover boards according to "Mechanically Fastened Insulation"

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requirements.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 07 51 00.11
BUILT-UP BITUMINOUS ROOFING, HOT-APPLIED

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section includes hot-applied bituminous [hybrid] built-up roofing with aggregate to match existing roofing. Occurs at existing roof over vault.

1.2 RELATED WORK

- A. Wood cants, blocking, and wood edge strips: Section 06 10 00, ROUGH CARPENTRY.
- D. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- E. Vapor barrier: Section 07 22 00, ROOF AND DECK INSULATION.
- F. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- G. Miscellaneous items: Section 07 72 00, ROOF ACCESSORIES.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with
Low Slope Roofing Systems
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
ASCE/SEI-7-10.....Minimum Design Loads for Buildings and Other
Structures
- D. Asphalt Roofing Manufacturers Association/National Roofing Contractors Association (ARMA/NRCA): Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing
- E. ASTM International (ASTM):
C1370-00(R2005).....Determining the Chemical Resistance of
Aggregates for Use in Chemical-Resistant Sulfur

- Polymer Cement Concrete and Other Chemical-Resistant Polymer Concretes
- D146-04.....Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
- D312-00(R2006).....Asphalt Used in Roofing
- D751-06.....Coated Fabrics
- D1863-05.....Mineral Aggregate Used on Built-Up Roofs
- D2178-04.....Asphalt Glass Felt Used in Roofing and Waterproofing
- D4263-83(2005).....Indicating Moisture in Concrete by the Plastic Sheet Method
- D4586-07.....Asphalt Roof Cement, Asbestos Free
- D4601-04.....Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
- D4897-01(2009).....Asphalt Coated Glass Fiber Venting Base Sheet Used in Roofing
- D5147-07.....Sampling and Testing Modified Bituminous Sheet Material
- E108-10.....Fire Tests of Roof Coverings
- E408-71(R2008).....Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
- F. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
- 4450-89.....Approved Standard for Class 1 Insulated Steel Deck Roofs
- 4470-10.....Approved Standard for Class 1 Roof Coverings
- 1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof Components
- 1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- I. National Roofing Contractors Association: Roofing and Waterproofing Manual
- J. U.S. Environmental Protection Agency (EPA):
- EPA 600/R13/116-02.....Method for the Determination of Asbestos in Bulk Building Materials

K. U.S. Department of Agriculture (USDA): USDA BioPreferred Catalog,
www.biopreferred.gov

L. U.S. Department of Energy (DoE): Roof Products Qualified Product List,
www.energystar.gov

1.4 PERFORMANCE REQUIREMENTS

A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

1.5 QUALITY CONTROL

A. Installer Qualifications:

1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.

B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.

2. Provide manufacturer's label on each container or certification with each load of bulk bitumen, indicating Flash Point (FP), Finished Blowing Temperature (FBT), Softening Point (SP), Equiviscous Temperature (EVT).
3. Provide manufacturer's certification that field applied bituminous coatings and mastics, and field applied roof coatings comply with limits for Volatile Organic Compounds (VOC) per the National Volatile Organic Compound Emission Standards for Architectural Coatings pursuant to Section 183(e) of the Clean Air Act with limits as follows:
 - a. Bituminous Coatings and Mastics: 500 g/l (4.2 lb/gal.).
 - b. Roof Coatings: 250 g/l (2.1 lb/gal.).
- D. Roofing system design standard requirements:
 1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
 2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
 3. Recommendations of ANSI/SPRI ES-1 for roof edge design.
- E. Pre-Roofing Meeting:
 1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Resident Engineer.
 2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
 3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.

c. Examine samples and installation instructions of manufacturer.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.
- B. Product Data:
 - 1. Asphalt and adhesive materials.
 - 2. Base and ply sheet roofing and flashing membrane.
 - 3. Roofing cement.
 - 4. Fastening requirements.
 - 5. Roof walkway.
 - 6. Aggregate surfacing and surfacing adhesive.
 - 7. Coating.
 - 8. Ballast and protection mat.
 - 9. Application instructions.
- C. Warranty: 10 years for patched areas.
- D. Field reports of roofing inspector.
- E. Temporary protection plan. Include list of proposed temporary materials.
- F. Contract Close-out Submittals:
 - 1. Maintenance Manuals.
 - 2. Warranty signed by installer and manufacturer.

1.7 DELIVERY, STORAGE AND MARKING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to built-up roofing for storage, handling and installation.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.

- C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

1.9 WARRANTY

- A. Roofing system is subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period for incidental roof patching is not required.

PART 2 - PRODUCTS

2.1 ADHESIVE AND ASPHALT MATERIALS:

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Water-Based Asphalt Primer: Water-based, polymer modified, asphalt primer with the following physical properties:
1. Asbestos Content, EPA 600/R13/116: None.
 2. Volatile Organic Compounds (VOC), maximum, ASTM D 3960: 65 g/L.
- C. Asphalt: ASTM D312, Type III or IV for roof membrane. Use Type I for pour coat unless specified otherwise.
- D. Cold-Applied Adhesive for membrane flashing: One-part, cold-applied adhesive specially formulated for compatibility and use with specified roofing membranes and flashings, with the following physical properties:
1. Asbestos Content, EPA 600/R13/116: None.
 2. Volatile Organic Compounds (VOC), maximum, ASTM D 6511: <250 g/L.
 3. Nonvolatile Content, minimum, ASTM D 6511: 75 percent.
 4. Uniformity and Consistency, ASTM D 6511: Pass.
- E. Roof Cement: ASTM D4586, Type II.

2.2 MEMBRANE AND SHEET MATERIALS:

- A. Membrane Materials, General: Provide combination of base, ply, and cap sheet materials that have been tested in combination and comply with load/strain properties performance requirement in Part 1 of this Section.

- B. Base Sheet: ASTM D 4601, Type II, nonperforated, asphalt-impregnated and coated glass-fiber sheet dusted with fine mineral surfacing on both sides, with the following properties:
 - 1. Breaking Strength, minimum, ASTM D 146: cross machine direction, 12.2 kN/m (70 lbf/in).
 - 2. Pliability, 12.7 mm (1/2 inch) radius bend, ASTM D 146: No failures.
- C. Ply Sheet: ASTM D2178, Type VI, heavy-duty ply sheet.
 - 1. Breaking Strength, minimum, ASTM D 146: machine direction, 80 lbf/in (14.0 kN/m); cross machine direction, 80 lbf/in (14.0 kN/m).F.
- F. Cap Sheet: Same as ply sheet.
- G. Cap Sheet: ASTM D3909, asphalt-impregnated and -coated, glass-fiber cap sheet, with white coarse mineral-granule top surfacing and fine mineral surfacing on bottom surface.
- H. Gravel to match existing roofing.

2.3 FASTENERS

- A. Roofing Fasteners: Factory-coated steel fasteners and metal or plastic plates, where applicable, meeting requirements of FM Approvals 4470, tested by fastener manufacturer for required pullout strength, and recommended by roofing manufacturer for application.
- B. Accessory Fasteners: Corrosion-resistant fasteners compatible with adjacent materials and recommended for application by manufacturer of component to be fastened.

2.4 SURFACING AND COATINGS

- A. Aggregate Surfacing, Gravel: To match existing.
- B. Aggregate Surfacing Adhesive: Cold-applied surfacing adhesive, with VOC content less than 250 g/L, formulated for fire-resistant properties.
- C. Aggregate Surfacing Adhesive, Solar Reflective: One-part, white, highly reflective polymeric surfacing adhesive, CRRC listed and California Title 24 Energy Code compliant when combined with approved white gravel, with following physical properties:
 - 1. Asbestos Content, EPA 600 R13/116: None.

2. Volatile Organic Compounds (VOC), maximum, ASTM D 6511: 250 g/L.
3. Nonvolatile Matter, minimum ASTM D 6511: 50 percent.
5. Reflectance (adhesive plus aggregate), ASTM C 1549: 71 percent.
6. Thermal emittance (adhesive plus aggregate), ASTM C 1371: 0.85.
7. Solar Reflectance Index (SRI), adhesive plus gravel, ASTM E 1980: 86.

2.5 ROOF WALKWAY:

- A. Prefabricated asphalt plank consisting of a homogeneous core of asphalt, plasticizers and inert fillers, bonded by heat and pressure between two saturated and coated sheets of felt:
 1. Top side of plank surfaced with ceramic granules. Granule Color: White.
 2. Size: Minimum 13 mm (1/2-inch) thick, manufacturer's standard size, but not less than 300 mm (12 inches) in least dimension and 600 mm (24 inches) in length.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
- B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.2 PREPARATION

- A. Dry out surfaces that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.
- C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.
- D. Remove projections that might damage materials.
- E. Concrete Decks, except Insulating Concrete:
 1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.

2. Test concrete decks for moisture by pouring one pint of hot bitumen at 204 degrees C (400 degrees F.) or EVT on deck at start of each day's Work and at start of each new roof area or plane. Do not proceed if test sample foams or can be easily (cleanly) stripped after cooling.
3. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
4. 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.
2. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.
3. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.
4. At base flashing to be repaired, either bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

I. Fume Management for Roofing at Occupied Facilities:

1. Use fume recovery system for hot-applied installations when directed by Owner
2. Operate large fans during placement of hot-applied asphalt to direct airflow away from operating intake louvers.

3.3 HEATING BITUMEN

- A. Heat the asphalt to the equiviscous temperature plus or minus -4 deg. C (25 deg. F) at the time of application:
1. Do not heat asphalt greater than 38 deg. C (100 deg. F) above the equiviscous temperature.

2. When the equiviscous temperature is not furnished by the asphalt manufacturer, do not heat asphalt above 275 deg. C (525 deg. F) for Type III and IV with temperature not less than 250 deg. C (475 deg. F) at time of application.
- B. Do not heat bitumen above the flash point temperature.
- C. Provide heating kettles with a thermometer kept in operating condition. Attend kettle during heating to insure that the bitumens are heated within the temperatures specified.
- D. Use type III and Type IV asphalt between plies.
- E. Do not mix different type of asphalt in kettle.

3.4 TEMPORARY PROTECTION

- A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
- B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
 1. Glaze coat exposed surfaces of felts to seal within the bitumen coating. Do not leave felt surfaces or edges exposed.
- C. Provide for removal of water or drainage of water away from the work.
- D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

3.5 INSTALLATION, GENERAL

- A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FM 4450 and FM 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with

recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.

- B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations, including ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing"
- C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.
- D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.
- E. Installation Conditions:
 - 1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
 - 2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
 - 3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
 - a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
 - b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.6 INSTALLATION OF BUILT-UP BITUMINOUS ROOFING

- A. Primer: Apply primer to substrates where recommended by roofing manufacturer, in application quantities recommended by roofing manufacturer.
- B. Hot Roofing Asphalt: Apply hot roofing asphalt in quantities required, immediately followed by membrane materials embedded therein before bitumen cools below the application temperature limit.
 - 1. Provide uniform and positive adhesion between all installed materials, including adhesion to insulation or substrate, and between each ply of felt.

2. Do not apply more material than can be covered at one time except for glaze coats.
3. Recoat cooled areas.
4. Do not allow bitumen to penetrate joints or enter building. Where mopping is applied directly to a substrate, tape joints. When applying steep asphalt, hold mopping back 50mm (2 inches) from each side of joint.

C. Application Rates:

1. Between substrate and sheets and between plies: 10 to 17.5 kg per 10 sq. m (20 to 35 lbs per 100 sq. ft.).
2. Glaze coats: 7 to 11 Kg per 10 sq. m (15 to 25 lbs per 100 sq. ft.).
3. Pour coats: 25 to 30 Kg per 10 sq. m (55 to 65 lbs per 100 sq. ft.).
4. Provide asphalt quantities within the indicated ranges, unless recommended otherwise in the roofing materials manufacturer's printed data.

D. Cold-Applied Adhesive:

1. Apply cold-applied adhesive in a uniform application at rate recommended by manufacturer.

E. Built-Up Membrane Sheets:

1. Number of Plies: [4], minimum, including cap sheet, and not including base sheet if any. Provide additional plies as required to meet load/strain properties specified in Part 1 of this Section.
2. Commence the laying of sheets at the low points.
3. Roll sheets into hot roofing asphalt brushing down to firmly embed, free of wrinkles, fish mouths, blisters, bubbles, voids, air pockets or other defects that prevent complete adhesion:
4. Cut to fit closely around pipes, roof drains, bitumen stops, and similar roof projections.
5. Lap sheets shingle fashion starting with starter strips at right angles to slope of roof.
6. Laps for base sheet and ply sheets:
 - a. Base sheet, lapped 50 mm (2-inches).
 - b. Two plies with 450 mm (18-inches) and 900 mm (36-inch) starting widths, lapped 480 mm (19-inches).

- c. Three plies with 300 mm (12-inches) 600 mm (24-inches) and 900 mm (36-inch) starting widths, lapped 624 mm (24-1/2 inches).
 - d. Four plies with 230, 460, 690 and 900 mm (9, 18, 27 and 36-inch) starting widths, lapped 700 mm (27-1/2 inches).
 - e. End joints of ply and base sheet, lapped 50 mm (2-inches).
Stagger end joints in relation to joints in adjacent and proceeding plies.
- G. Roof edges and terminations:
- 1. Where nailers occur at roof edges under gravel stops or penetrations to receive metal base flashing, apply a continuous strip of underlayment over the nailers before the first ply sheet is applied. Strip shall be installed on top of venting base sheet if any.
 - 2. After membrane is installed, turn the underlayment back over the roofing, and secure in place with hot roofing asphalt before gravel stops or other metal flanges extending out onto the membrane are installed.
 - 3. Where cants occur at vertical surfaces, cut off roofing sheets two inches above top of cant strips, except at prefabricated curbs, scuttles and other roof accessories having integral cants, extend membrane over cant and up vertical surface to top of curb or nailer as shown.
 - 4. Where fascia-cant occurs at roof edges, extend membrane beyond outside cant face and cut off at outside after base flashing is installed.
 - 5. Where reglet occurs at vertical surfaces, extend plies roofing sheets up into reglet the full depth of the reglet.
- H. Base Sheet Installation:
- 1. One ply of base sheet dry to deck, except mop between laps. Lap and attach as specified to deck.
- J. Roof Ply Installation:
- 1. Extend first ply sheet 100 mm (4-inches) beyond the insulation and the second ply sheet 75 mm (3-inches) beyond the first. Lap ends 75 mm (3-inches) with joints broken 450 mm (18-inches) in each ply.
- K. Cap Sheet Installation:
- 1. Install cap sheet in a solid mopping of hot asphalt.
 - 2. Install cap sheet in a solid application of cold-applied adhesive.

3. Extend cap sheet 100 mm (4-inches) beyond the underlying ply 75 mm (3-inches). Lap ends 75 mm (3-inches) with joints broken 450 mm (18-inches) in each ply.

3.7 BASE FLASHING:

- A. Prime vertical surfaces of masonry and concrete with asphalt primer except where vented base sheet is required to provide edge venting.
- B. Apply flashing on top of built-up roofing, up face of cant and vertical surfaces, at least 200 mm (8-inches) above the roof, full height beneath counter flashing or top of curb flashing:
 1. At fascia-cants, extend to top of cant and cut off.
 2. Extend plies of roofing into reglet the full depth of the reglet.
- C. Except at metal fascia cants, secure top edge of base flashing with nails on a line approximately one inch below top edge, spaced not more than 200 mm (8-inches) on center.
 1. Cover all nail heads with roof cement.
 2. Cover the top of the base flashing with counter flashing as specified in Section 07 60 00, FLASHING AND SHEET METAL. At the cants secure the top edge of the flashing with fascia compression clamp as specified in Section 07 60 00, FLASHING AND SHEET METAL.
- D. Install flashing using longest pieces practicable. Complete splices between flashing and main roof sheet before bonding to vertical surface. Seal splice not less than 76mm (3-inches) beyond fasteners that attach membrane to blocking. Apply bonding adhesive to both flashing and surface to which flashing is being adhered per manufacturer recommendations. Nail top of flashing 300mm (12-inches) on center under metal counter flashing or cap.
 1. Parapet Walls: Extend up parapet and turn over top edge. Apply with 100 percent adhesive.
- E. Install flashing over cants to make system watertight.
- F. Install flashing before final roofing coat and aggregate are installed.

3.8 STRIPPING:

- A. Set flanges of metal flashing in roof cement before the final bituminous coat and roof aggregate are installed and nail to blocking per Section 07 60 00, FLASHING AND SHEET METAL.

- B. Before the final bituminous coat and aggregate are installed, cover that portion of the horizontal flanges of metal base flashing, gravel stops and other flanges, extending onto the roofing with flashing sheet.

3.9 AGGREGATE SURFACING:

- A. After bituminous base flashing and stripping has been installed, uniformly coat the entire roof surface, except cants, with bitumen pour coat at the rate scheduled.
- B. Use type III asphalt on slopes over 1:10 (one inch per foot).
- C. While still hot, embed aggregate to cover the roofing sheet completely without bare spots, but not less than 20 Kg/m² (400 pounds/) of dry gravel or 15 Kg/m² (300 pounds/100 square feet) of dry slag per. Do not leave any exposed bitumen.
- D. Do not embed aggregate under roof walkways.
- E. In cold weather preheat aggregate prior to application.
- F. Do not place aggregate material in piles or rows on bare or glaze coated felt.
- G. If aggregate surfacing is delayed, promptly apply glaze coat of hot roofing asphalt at rate scheduled.

3.10 REPAIR AND ALTERATIONS TO EXISTING ROOF

- A. Areas to be altered or repaired, remove loose aggregate and aggregate not firmly embedded where new penetrations occur or repairs are required:
 - 1. Remove aggregate 900 mm (3 feet) beyond areas to be cut.
 - a. Clean, dry and store aggregate away from roof area until ready to reuse.
 - b. Remove unsuitable and excess aggregate not used from Project.
- B. Cut and remove existing roof membrane for new work to be installed.
Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover with roof cement to completely embed the felt.

- C. Bend up cap flashing or temporarily remove at built-up base flashing to be repaired. Brush and scrape away deteriorated and loose bitumen, felts or surface material of built-up base flashing.
- D. Repairs to existing membrane and base flashing:
 - 1. Remove temporary patches prior to starting new work.
 - 2. Blisters and fish mouths:
 - a. Cut blisters open and turn membrane back to fully adhered portion. Cut fish mouths so membrane can be turned back and subsequently laid flat.
 - b. Heat membrane to facilitate bending and to dry surface of exposed blister areas.
 - c. Mop turned back membrane in hot bitumen. Roll to insure full adhesion and embedment in substrate.
 - d. Cover cut areas with two plies of felt. Extend first ply 100 mm (4-inches) beyond cut area edge. Extend second 100 mm (4 inches) beyond first ply. Mop down in hot bitumen as specified for new work. Resurface to match existing.
 - 3. Exposed Felts:
 - a. Cut away exposed deteriorated edges of sheets.
 - b. Glaze coat felt edges.
 - c. Resurface to match existing.
 - 4. Built-up Base Flashing:
 - a. Restore felts and cap sheet removed, lapping 100 mm (4-inches) over existing.
 - b. Install new felts and cap sheet as specified for new work.
 - 5. Horizontal Metal Flanges:
 - a. Remove loose, buckled or torn stripping.
 - b. Remove loose fasteners and install new fasteners.
 - c. Restrip flanges as specified for new work.
 - 6. Resurfacing:
 - a. Over repaired membrane, embed aggregate as specified for new work.
 - b. Cover all membrane areas. Do not leave any exposed membrane surface.
- E. Match existing roofing materials and construction. Use bitumen compatible with existing for roof repair and alteration.

- F. Perform alterations, maintenance and repairs to roof membrane immediately after membrane has been cut or damaged, with permanent new work as specified in this specification. Repair items damaged in surface preparation and aggregate removal.

3.15 FIELD QUALITY CONTROL

- A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- C. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
 - 1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.16 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.
- C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

3.17 TESTING

- A. Provide flood testing of the roof as a whole to the satisfaction of the government.

- - - E N D - - -

SECTION 07 54 23
THERMOPLASTIC POLYOLEFIN (TPO) ROOFING PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Thermoplastic Polyolefin (TPO) sheet roofing mechanically fastened/ to roof deck, to match existing roofing at 4th floor level. Where roof requires patching or modifications at removed HVAC elements at 4th floor level only.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE CONSTRUCTION REQUIREMENTS.
- B. Treated wood framing, blocking, and nailers: Section 06 10 00, ROUGH CARPENTRY
- C. Roof Insulation: Section 07 22 00, ROOF AND DECK INSULATION.
- D. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- E. Roof hatches, equipment supports, dome type skylights, and gravity ventilators: Section 07 72 00, ROOF ACCESSORIES
- F. Miscellaneous items: Section 07 71 00, ROOF SPECIALTIES/ Section 07 72 00, ROOF ACCESSORIES.

1.3 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only. Editions of applicable publications current on date of issue of bidding documents apply unless otherwise indicated.
- B. American National Standards Institute/Single-Ply Roofing Institute (ANSI/SPRI):
ANSI/SPRI ES-1-03.....Wind Design Standard for Edge Systems Used with
Low Slope Roofing Systems.
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
ASCE/SEI-7-10.....Minimum Design Loads for Buildings and Other
Structures
- D. ASTM International (ASTM):

- C67-09.....Standard Test Methods for Sampling and Testing
Brick and Structural Clay Tile
- C140-09.....Standard Test Methods for Sampling and Testing
Concrete Masonry Units and Related Units
- C1371-04.....Standard Test Method for Determination of
Emittance of Materials Near Room Temperature
Using Portable Emissometers
- C1549-04.....Standard Test Method for Determination of Solar
Reflectance Near Ambient Temperature Using a
Portable Solar Reflectometer
- D4263.....Standard Test Method for Indicating Moisture in
Concrete by the Plastic Sheet Method
- D4434-06.....Standard Specification for Poly (Vinyl
Chloride) Sheet Roofing
- D6878-08.....Standard Specification for Thermoplastic
Polyolefin Based Sheet Roofing
- E108-10.....Standard Test Methods for Fire Tests of Roof
Coverings
- E408-71(R2008).....Standard Test Methods for Total Normal
Emittance of Surfaces Using Inspection-Meter
Techniques
- E1918-06.....Standard Test Method for Measuring Solar
Reflectance of Horizontal and Low-Sloped
Surfaces in the Field
- E1980-01.....Standard Test Method for Measuring Solar
Reflectance of Horizontal and Low-Sloped
Surfaces in the Field
- E. American Society of Heating, Refrigeration, and Air Conditioning
Engineers (ASHRAE)
ASHRAE 90.1-2007.....Energy Standard for Buildings Except Low-Rise
Residential Buildings, Appendix f.
- F. Cool Roof Rating Council:
CRRC-1.....Product Rating Program, www.coolroofs.org
- G. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
4450-89.....Approved Standard for Class 1 Insulated Steel
Deck Roofs
4470-10.....Approved Standard for Class 1 Roof Coverings

- 1-28-09.....Loss Prevention Data Sheet: Design Wind Loads.
- 1-29-09.....Loss Prevention Data Sheet: Above-Deck Roof
Components
- 1-49-09.....Loss Prevention Data Sheet: Perimeter Flashing
- H. National Roofing Contractors Association: Roofing and Waterproofing
Manual
- I. U.S. Department of Agriculture (USDA): USDA BioPreferred
Catalog, www.biopreferred.gov
- J. U.S. Department of Energy (DoE): Roof Products Qualified Product
List, www.energystar.gov

1.4 PERFORMANCE REQUIREMENTS

- A. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience. Match existing adjacent roofing being patched.

1.5 QUALITY CONTROL

- A. Installer Qualifications:
 - 1. Licensed or approved in writing by manufacturer to perform work under warranty requirements of this Section.
 - 2. Employ full-time supervisors knowledgeable and experienced in roofing of similar types and scopes, and able to communicate with owner and workers.
- B. Inspector Qualifications: Inspection of work by third-party technical inspector or technical representative of manufacturer experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:
 - 1. An authorized full-time technical employee of the manufacturer, not engaged in the sale of products.
 - 2. An independent party certified as a Registered Roof Observer by the Roof Consultants Institute (RCI), retained by the Contractor or the Manufacturer and approved by the Manufacturer.

C. Product/Material Requirements:

1. Obtain products from single manufacturer or from sources recommended by manufacturer for use with roofing system and incorporated in manufacturer's warranty.
2. Bio-Based Materials: For Products designated by the USDA's Bio Preferred program, provide products that meet or exceed USDA recommendations for bio-based content, so long as products meet all performance requirements in this specifications section. For more information regarding the product categories covered by the Bio-Preferred program, visit <http://www.biopreferred.gov>

D. Roofing system design standard requirements:

1. Recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to modified bituminous sheet roofing for storage, handling and application.
2. Recommendations of FM Approvals 1-49 Loss Prevention Data Sheet for Perimeter Flashings.
3. Recommendations of ANSI/SPRI ES-1 for roof edge design.

E. Pre-Roofing Meeting:

1. Upon completion of roof deck installation and prior to any roofing application, hold a pre-roofing meeting arranged by the Contractor and attended by the Roofing Inspector, Material Manufacturers Technical Representative, Roofing Applicator, Contractor, and Resident Engineer.
2. Discuss specific expectations and responsibilities, construction procedures, specification requirements, application, environmental conditions, job and surface readiness, material storage, and protection.
3. Inspect roof deck at this time to:
 - a. Verify that work of other trades which penetrates roof deck is completed.
 - b. Determine adequacy of deck anchorage, presence of foreign material, moisture and unlevel surfaces, or other conditions that would prevent application of roofing system from commencing or cause a roof failure.
 - c. Examine samples and installation instructions of manufacturer.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, SAMPLES.
- B. Product Data:
 - 1. Adhesive materials.
 - 2. Membrane sheet roofing and flashing membrane.
 - 3. Roofing cement.
 - 4. Roof walkway.
 - 5. Fastening requirements.
 - 6. Application instructions.
- C. Temporary protection plan. Include list of proposed temporary materials.
- D. Contract Close-out Submittals:
 - 1. Maintenance Manuals.
 - 2. Warranty signed by installer and manufacturer.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Comply with the recommendations of the NRCA "Roofing and Waterproofing Manual" applicable to single ply membrane roofing for storage, handling and installation.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Environmental Controls: Refer to Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- C. Protection of interior spaces: Refer to Section 01 00 00, GENERAL REQUIREMENTS.

1.9 WARRANTY

Roofing work subject to the terms of the Article "Warranty of Construction," FAR clause 52.246-21.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

- A. TPO Sheet: ASTM D6878, internally fabric or scrim reinforced, 1.5 mm (60 mils) thick, with fabric backing.
 - 1. Color: White.

2.2 ACCESSORIES:

- A. Sheet Flashing: Manufacturer's standard sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.
- B. Bonding Adhesive: Manufacturer's standard, water based.
- C. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick; with anchors.
- D. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 25 mm wide by 1.3 mm (1 inch wide by 0.05 inch) thick, prepunched.
- E. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with FM Approvals 4470, designed for fastening membrane to substrate.
- F. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 5 mm (3/16 inch) thick, and acceptable to membrane roofing system manufacturer.
- G. Miscellaneous Accessories: Provide sealers, preformed flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories acceptable to manufacturer.

2.3 ADHESIVE AND SEALANT MATERIALS:

- A. General: Adhesive and sealant materials recommended by roofing system manufacturer for intended use, identical to materials utilized in approved listed roofing system, and compatible with roofing membrane.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Examine substrates and conditions with roofing Installer and roofing inspector to verify compliance with project requirements and suitability to accept subsequent roofing work. Correct unsatisfactory conditions before proceeding with roofing work.
- B. Do not apply roofing if roof surface will be used for subsequent work platform, storage of materials, or staging or scaffolding will be erected thereon unless system is protected.

3.2 PREPARATION

- A. Complete roof deck construction prior to commencing roofing work:
 - 1. Install curbs, blocking, edge strips, nailers, cants, and other components where insulation, roofing, and base flashing is attached to, in place ready to receive insulation and roofing.
 - 2. Complete deck and insulation to provide designed drainage to working roof drains.
 - 3. Document installation of related materials to be concealed prior to installing roofing work.
- B. Dry out surfaces, including the flutes of metal deck that become wet from any cause during progress of the work before roofing work is resumed. Apply materials to dry substrates.
- C. Sweep decks to broom clean condition. Remove all dust, dirt or debris.
- D. Remove projections that might damage materials.
- E. Concrete Decks, except Insulating Concrete:
 - 1. Test concrete decks for moisture prior to application of roofing materials. Test for capillary moisture by plastic sheet method according to ASTM D4263.
 - 2. Prime concrete decks, including precast units, with primer as specified. Keep primer back four inches from joints in precast units.
 - 3. Allow primer to dry before application of adhesive.
- F. Insulating Concrete Decks:
 - 1. Allow to dry out for at least five days after installation before the placement of materials.

2. If rain occurs during or at end of drying period or during installation of roofing, allow additional drying time before the placement of the roofing materials.
- G. Poured Gypsum Decks: Dry out poured gypsum in accordance with manufacturer's printed instructions prior to application of roofing materials.
- H. Existing Membrane Roofs and Repair Areas:
1. Comply with requirements in Section 07 01 50.19 PREPARATION FOR REROOFING.
 2. At areas to be altered or repaired, remove loose, damaged, or cut sheet that is not firmly adhered only where new penetrations occur or repairs are required.
 3. Cut and remove existing roof membrane for new work to be installed. Clean cut edges and install a temporary seal to cut surfaces. Use roof cement and one layer of 7 Kg (15 pound) felt strip cut to extend 150 mm (6 inches) on each side of cut surface. Bed strip in roof cement and cover strip with roof cement to completely embed the felt.
 4. At modified bituminous base flashing to be repaired, either bend up cap flashing or temporarily remove cap flashing. Brush and scrape away all deteriorated sheets or surface material of base flashing.

3.3 TEMPORARY PROTECTION

- A. Install temporary protection at the end of day's work and when work is halted for an indefinite period or work is stopped when precipitation is imminent. Comply with approved temporary protection plan.
- B. Install temporary cap flashing over the top of base flashings where permanent flashings are not in place to provide protection against moisture entering the roof system through or behind the base flashing. Securely anchor in place to prevent blow off and damage by construction activities.
- C. Provide for removal of water or drainage of water away from the work.
- D. Provide temporary protection over installed roofing by means of duckboard walkways, plywood platforms, or other materials, as approved by Resident Engineer, for roof areas that are to remain intact, and that are subject to foot traffic and damage. Provide notches in sleepers to permit free drainage.

3.4 INSTALLATION, GENERAL

- A. FM Approvals Installation Standard: Install roofing membrane, base flashings, wood cants, blocking, curbs, and nailers, and component materials in compliance with requirements in FMG 4450 and FMG 4470 as part of a membrane roofing system as listed in FM Approval's "RoofNav" for fire/windstorm classification indicated. Comply with recommendations in FM Approvals' Loss Prevention Data Sheet 1-49, including requirements for wood nailers and cants.
- B. NRCA Installation Standard: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations.
- C. Manufacturer Recommendations: Comply with roofing system manufacturer's written installation recommendations.
- D. Coordination with related work: Coordinate roof operations with roof insulation and sheet metal work so that insulation and flashings are installed concurrently to permit continuous roofing operations.
- E. Installation Conditions:
 - 1. Apply dry roofing materials. Apply roofing work over dry substrates and materials.
 - 2. Apply materials within temperature range and surface and ambient conditions recommended by manufacturer.
 - 3. Except for temporary protection, do not apply materials during damp or rainy weather, during excessive wind conditions, nor while moisture (dew, snow, ice, fog or frost) is present in any amount in or on the materials to be covered or installed:
 - a. Do not apply materials when the temperature is below 4 deg. C (40 deg. F).
 - b. Do not apply materials to substrate having temperature of 4 deg. C (40 deg. F) or less.

3.5 INSTALLATION OF TPO ROOFING

- A. Do not allow the membrane to come in contact with surfaces contaminated with asphalt, coal tar, oil, grease, or other substances which are not compatible with TPO.
- B. Install the membrane so the sheets run perpendicular to the long dimension of the insulation boards.
- C. Commence installation at the low point of the roof and work towards the high point. Lap the sheets so the flow of water is not against the edges of the sheet.

- D. Position the membrane so it is free of buckles and wrinkles.
- E. Roll sheet out on deck; inspect for defects as being rolled out and remove defective areas. Allow for relaxing before proceeding.
 - 1. Lap edges and ends of sheets 50 mm (two 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.
 - 3. Check seams to ensure continuous adhesion and correct defects.
 - 4. Finish edges of laps with a continuous beveled bead of sealant to sheet edges to provide smooth transition.
 - 5. Finish seams as the membrane is being installed (same day).
 - 6. Anchor perimeter to deck or wall as specified.
- F. Repair areas of welded seams where samples have been taken or marginal welds, bond voids, or skips occurs.
- G. Repair fishmouths and wrinkles by cutting to lay flat and installing patch over cut area extending 100 mm (four-inches) beyond cut.
- H. Membrane Perimeter Anchorage:
 - 1. Install metal fastening strip at the perimeter of each roof level, curb flashing, expansion joints and similar penetrations as indicated and in accordance with membrane manufacturer's instructions on top of roof membrane to deck or wall.
 - 2. Mechanically Fastened Metal Fastening Strip:
 - a. Set top of mechanical fastener set flush with top surface of the metal fastening strip. Space mechanical fasteners a maximum 300 mm (12 inches) on center starting 25 mm (one inch) from the end of the nailing strip.
 - b. When strips are cut round corners and eliminate sharp corners.
 - c. After mechanically fastening strip cover and seal strip with a six-inch wide roof membrane strip; heat weld to roof membrane and seal edges.
 - d. At roof edge metal, turn the membrane down over the front edge of the blocking or the nailer to below blocking. Secure the membrane to the vertical portion of the nailer; or, if required by the membrane manufacturer with fasteners spaced not over 300 mm (12 inches) on centers.

- e. At parapet walls, intersecting building walls and curbs, secure the membrane to the structural deck with fasteners 300 mm (12 inches) on centers or as shown on NRCA manual.

I. Adhered System:

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

J. Mechanically-Attached System:

1. Secure the membrane to the structural deck with fasteners through stress plate or batten strips spaced and patterned in accordance with the membrane manufacturer's instructions to achieve specified wind uplift performance.
2. When fasteners are installed within the laps of adjoining sheets, position the fastener so that the stress plates are a minimum 13 mm (1/2)inch) from the edge of the sheets.
3. Where fasteners are installed over the membrane after the seams have been welded, cover the fasteners with a minimum 175 mm (seven inch) wide round TPO membrane cap centered over the fasteners. If batten strips are used cover the strip with a minimum 175 mm (seven inch) wide TPO strip centered over the batten. Heat weld to the roof membrane and finish edges with sealant as specified. Finish edges with sealant as specified.
4. Before installing fasteners into cast in place concrete, pre-drill the correct size hole into the deck. Drill the hole 9 mm (3/8 inch) deeper than the fastener penetration.

3.6 INSTALLATION OF FLASHING

- A. Install flashings as the membrane is being installed. If the flashing can not be completely installed in one day, complete the installation until the flashing is in a watertight condition and provide temporary covers or seals.

B. Installing TPO Base Flashing and Pipe Flashing:

1. Install TPO flashing membranes to pipes, wall or curbs to a height not less than eight-inches above roof surfaces and 100 mm (four inches) on roof membrane.
 - a. Adhere flashing to pipe, wall or curb with adhesive.
 - b. Form inside and outside corners of TPO flashing membrane in accordance with NRCA manual. Form pipe flashing in accordance with NRCA manual use pipe boot.
 - c. Lap ends not less than 100 mm (four inches).
 - d. Heat weld flashing membranes together and flashing membranes to roof membranes. Finish exposed edges with sealant as specified.
 - e. Install flashing membranes in accordance with NRCA manual.
2. Anchor top of flashing to walls or curbs with fasteners spaced not over 200 mm (eight inches) on centers. Use fastening strip on ducts. Use pipe clamps on pipes or other round penetrations.
3. Apply sealant to top edge of flashing.

D. Repairs to membrane and flashings:

1. Remove sections of TPO sheet roofing or flashing that is creased wrinkled or fishmouthed.
2. Cover removed areas, cuts and damaged areas with a patch extending 100 mm (four inches) beyond damaged, cut, or removed area. Heat weld to roof membrane or flashing. Finish edge of lap with sealant as specified.

3.9 FIELD QUALITY CONTROL:

- A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
1. Notify Architect and Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing work where test results or inspections indicate that they do not comply with specified requirements.
1. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.10 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of acceptance by Owner.
- C. Clean overspray and spillage from adjacent construction. Clean membrane and restore surface to like-new condition meeting solar reflectance requirements.

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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 are specified in this section.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Manufactured flashing, copings, roof edge metal: Section 07 71 00 ROOF SPECIALTIES.
- C. Membrane base flashings and stripping: Section 07 51 00.11, BUILT-UP BITUMINOUS ROOFING, HOT APPLIED.
- D. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- E. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- F. Color of factory coated exterior architectural metal and anodized aluminum: Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Integral flashing components of manufactured roof specialties and accessories or equipment: Section 07 71 00, ROOF SPECIALTIES and Division 22, PLUMBING sections and Division 23 HVAC sections.
- H. Paint materials and application: Section 09 91 00, PAINTING.

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):
 - 1. AA-C22A41 Aluminum Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick
 - 2. AA-C22A42 Chemically etched medium matte, with integrally colored anodic coating, Class I Architectural, 0.7 mils thick
 - 3. AA-C22A44 Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored

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coating Class I Architectural, 0.7-mil thick finish

- C. American National Standards Institute/Single Ply Roofing Institute (ANSI/SPRI):
1. ANSI/SPRI ES-1-03 Wind Design for Edge Systems Used with Low Slope Roofing Systems
- D. American Architectural Manufacturers Association (AAMA):
1. AAMA 620 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Aluminum
 2. AAMA 621 Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates
- E. ASTM International (ASTM):
1. A167-99(R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 2. A653/A653M-09 Steel Sheet Zinc-Coated (Galvanized) or Zinc Alloy Coated (Galvanized) by the Hot- Dip Process
 3. B32-08 Solder Metal
 4. B209-07 Aluminum and Aluminum-Alloy Sheet and Plate
 5. B370-09 Copper Sheet and Strip for Building Construction
 6. D173-03 Bitumen-Saturated Cotton Fabrics Used in Roofing and Waterproofing
 7. D412-06 Vulcanized Rubber and Thermoplastic Elastomers-Tension
 8. D1187-97 (R2002) Asphalt Base Emulsions for Use as Protective Coatings for Metal
 9. D1784-08 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
 10. D3656-07 Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
 11. D4586-07 Asphalt Roof Cement, Asbestos Free
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
1. Architectural Sheet Metal Manual.
- G. National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500-06 Metal Finishes Manual
 2. Federal Specification (Fed. Spec):
 3. A-A-1925A Shield, Expansion; (Nail Anchors)
 4. UU-B-790A Building Paper, Vegetable Fiber

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- H. 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 lbf/sq. ft.): 1.92-kPa (40-lbf/sq. ft.) perimeter uplift force, 2.87-kPa (60-lbf/sq. ft.) corner uplift force, and 0.96-kPa (20-lbf/sq. ft.) outward force.
 2. Wind Zone 1: 1.00 to 1.44 kPa (21 to 30 lbf/sq. ft.): 2.87-kPa (60-lbf/sq. ft.) perimeter uplift force, 4.31-kPa (90-lbf/sq. ft.) corner uplift force, and 1.44-kPa (30-lbf/sq. ft.) outward force.
 3. Wind Zone 2: 1.48 to 2.15 kPa (31 to 45 lbf/sq. ft.): 4.31-kPa (90-lbf/sq. ft.) perimeter uplift force, 5.74-kPa (120-lbf/sq. ft.) corner uplift force, and 2.15-kPa (45-lbf/sq. ft.) outward force.
 4. Wind Zone 3: 2.20 to 4.98 kPa (46 to 104 lbf/sq. ft.): 9.96-kPa (208-lbf/sq. ft.) perimeter uplift force, 14.94-kPa (312-lbf/sq. ft.) corner uplift force, and 4.98-kPa (104-lbf/sq. ft.) outward force.
- B. Wind Design Standard: Fabricate and install **copings, roof-edge flashings**, etc. as shown, tested per ANSI/SPRI ES-1 to resist applicable design pressures.

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. Expansion joints
 4. Fascia-cant
- C. Manufacturer's Literature and Data: For all specified items, including:
1. Two-piece counterflashing
 2. Expansion joint cover, each type
 3. Nonreinforced, elastomeric sheeting
 4. Fascia-cant
- D. Certificates: Indicating compliance with specified finishing requirements, from applicator and contractor.

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PART 2 - PRODUCTS**2.1 FLASHING AND SHEET METAL MATERIALS**

- A. Stainless Steel: ASTM A167, Type 302B, dead soft temper.
- B. Aluminum Sheet: ASTM B209, alloy 3003-H14 except alloy used for color anodized aluminum shall be as required to produce specified color. Alloy required to produce specified color shall have the same structural properties as alloy 3003-H14.
- C. Galvanized Sheet: ASTM, A653.
- D. Nonreinforced, Elastomeric Sheet: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheet 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. Sheet 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 deg C (-20 deg F).
- E. Note that the City of Palo Alto does not allow copper roof accessories.

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 lbs/100 sf).
- C. Bituminous Paint: ASTM D1187, Type I.
- D. Fasteners:
 - 1. Use stainless steel for stainless steel and aluminum alloy. Use galvanized steel or stainless steel for galvanized steel.
 - 2. Nails:
 - a. Minimum diameter for aluminum nails 3 mm (0.105 inch).
 - b. Minimum diameter for stainless steel nails: 2 mm (0.095 inch) and annular threaded.
 - c. 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.
- E. Sealant: As specified in Section 07 92 00, JOINT SEALANTS for exterior locations.
- F. Roof Cement: ASTM D4586.

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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. Stainless steel: 0.25 mm (0.010 inch) thick.
 - 2. Galvanized steel: 0.5 mm (0.021 inch) thick.
- C. Exposed Locations:
 - 1. Stainless steel: 0.4 mm (0.015 inch).
- D. Thickness of aluminum or galvanized steel is specified with each item.

2.4 FABRICATION, GENERAL

- A. Jointing:
 - 1. In general, stainless steel joints, except expansion and contraction joints, shall be locked and soldered.
 - 2. Jointing of 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 (1 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. Soldering:
 - a. Pre tin both mating surfaces with solder for a width not less than 38 mm (1-1/2 inches) of stainless steel.
 - b. Wire brush to produce a bright surface before soldering lead coated copper.
 - c. Treat in accordance with metal producers recommendations other sheet metal required to be soldered.
 - d. Completely remove acid and flux after soldering is completed.
- B. Expansion and Contraction Joints:
 - 1. Fabricate in accordance with the Architectural Sheet Metal Manual recommendations for expansion and contraction of sheet metal work in continuous runs.
 - 2. Space joints as shown or as specified.
 - 3. Space expansion and contraction joints for stainless steel at intervals not exceeding 7200 mm (24 feet).
 - 4. Space expansion and contraction joints for aluminum at intervals not exceeding 5400 mm (18 feet), except do not exceed 3000 mm (10 feet) for gravel stops and fascia-cant systems.

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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 of minimum 0.6 mm (0.024 inch) thick stainless steel or 1.25 mm (0.050 inch) thick aluminum.
3. Use material compatible with sheet metal to be secured by the edge strip.
4. Fabricate in 3000 mm (10 feet) maximum lengths with not less than 19 mm (3/4 inch) loose lock into metal secured by edge strip.
5. Fabricate Strips for fascia anchorage to extend below the supporting wood construction to form a drip and to allow the flashing to be hooked over the lower edge at least 19 mm (3/4 inch).
6. Fabricate anchor edge maximum width of 75 mm (3 inches) or of sufficient width to provide adequate bearing area to insure a rigid installation using 0.8 mm (0.031 inch) thick stainless steel.

E. Drips:

1. Form drips at lower edge of sheet metal counter-flashings, fascias, gravel stops and 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

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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.

2.5 FINISHES

- A. Use same finish on adjacent metal or components and exposed metal surfaces unless specified or shown otherwise.
- B. In accordance with NAAMM Metal Finishes Manual AMP 500, unless otherwise specified.
- C. Finish exposed metal surfaces as follows, unless specified otherwise:
1. Stainless Steel: Finish No. 2B or 2D.
 2. Aluminum:
 - a. Fluorocarbon Finish: AAMA 620, high performance organic coating.
 3. Steel and Galvanized Steel:
 - a. Manufacturer's finish:
 - 1) 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. Window Sill Flashing and Lintel Flashing:
1. Use stainless steel.
 2. Turn up back edge as shown.
 3. 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 stainless steel, thickness specified unless specified otherwise.
 2. When flashing is over 250 mm (10 inches) in vertical height or horizontal width use 0.5 mm (0.018 inch) stainless steel.
 3. Use stainless steel at aluminum roof curbs where flashing contacts the aluminum.
 4. Use stainless steel at pipe flashings.

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- B. Fabricate metal base flashing up vertical surfaces not less than 200 mm (8 inch) nor more than 400 mm (16 inch).
- C. Fabricate roof flange not less than 100 mm (4 inches) wide unless shown otherwise. When base flashing length exceeds 2400 mm (8 feet) form flange edge with 13 mm (1/2 inch) hem to receive cleats.
- D. Form base flashing bent from strip except pipe flashing. Fabricate ends for riveted soldered lap seam joints. Fabricate expansion joint ends as specified.
- E. Pipe Flashing: (Other than engine exhaust or flue stack)
 - 1. Fabricate roof flange not less than 100 mm (4 inches) beyond sleeve on all sides.
 - 2. Extend sleeve up and around pipe and flange out at bottom not less than 13 mm (1/2 inch) and solder to flange and sleeve seam to make watertight.
 - 3. At low pipes 200 mm (8 inch) to 450 mm (18 inch) above roof:
 - a. Form top of sleeve to turn down into the pipe at least 25 mm (one inch).
 - b. Allow for loose fit around and into the pipe.
 - 4. At high pipes and pipes with goosenecks or other obstructions which would prevent turning the flashing down into the pipe:
 - a. Extend sleeve up not less than 300 mm (12 inch) above roofing.
 - b. Allow for loose fit around pipe.

2.8 COUNTERFLASHING (CAP FLASHING OR HOODS)

- A. Stainless steel, unless specified otherwise.
- B. Fabricate to lap base flashing a minimum of 100 mm (4 inches) with drip:
 - 1. Form lock seams for outside corners. Allow for lap joints at ends and inside corners.
 - 2. In general, form flashing in lengths not less than 2400 mm (8 feet) and not more than 3000 mm (10 feet).
 - 3. Two-piece, lock in type flashing may be used in-lieu-of one piece counter-flashing.
 - 4. Manufactured assemblies may be used.
 - 5. Where counterflashing is installed at new work use an integral flange at the top designed to be extended into the masonry joint or reglet in concrete.
 - 6. Where counterflashing is installed at existing work use surface applied type, formed to provide a space for the application of sealant at the top edge.
- C. Two-Piece Counterflashing:
 - 1. Receiver to extend into masonry wall depth of masonry unit with back

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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.

D. 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.

- E. 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.

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

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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

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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.

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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. 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

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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. 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.

C. Where vented edge occur install so lower edge of counterflashing is against base flashing.

D. When counterflashing is a component of other flashing install as shown.

3.5 COPINGS

A. General:

1. 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.
2. 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.

C. Stainless Steel Copings:

1. Join ends of sheets by a 19 mm (3/4 inch) locked and soldered seam, except at intervals of 9600 mm (32 feet), provide a 38 mm (1 1/2 inch) loose locked expansion joint filled with sealant or mastic.
2. At straight runs between 7200 mm (24 feet) and 19200 mm (64 feet) locate expansion joint at center.
3. At straight runs that exceed 9600 mm (32 feet) and form the leg of a corner locate the expansion joint not more than 4800 mm (16 feet)

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from the corner.

3.6 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 07 71 00**ROOF SPECIALTIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies equipment supports and other roof items shown.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- C. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY CONTROL

- A. All roof accessories shall be the products of manufacturers regularly engaged in producing the kinds of products specified.
- B. Each accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be completely assembled 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. Samples: Representative sample panel of color anodized aluminum not less than 100 mm x 100 mm (4 inch x 4 inch), except extrusions shall be a width not less than section to be used. Sample shall show coating with integral color and texture and shall include manufacturer's identifying label.
- C. Shop Drawings: Each item specified showing design, details of construction, installation and fastenings.
- D. Manufacturer's Literature and Data: Each item specified.
- E. 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

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extent referenced. The publications are referenced in the text by the basic designation only.

B. Federal Specifications (Fed. Spec.):

1. RR-G-1602D Grating, Metal, Other Than Bar Type (Floor, Except for Naval Vessels)

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

1. A653/A653M-10 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) By the Hot-Dip Process
2. B209/209M-07 Aluminum and Aluminum Alloy-Sheet and Plate
3. B221/221M-08 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
4. C612-10 Mineral Fiber Block and Board Thermal Insulation
5. D1187-97(R2002) Asphalt-Base Emulsions for Use as Protective Coatings for Metal

D. National Association of Architectural Metal Manufacturers (NAAMM):

1. AMP 500 Series Metal Finishes Manual

E. American Architectural Manufacturers Association (AAMA):

1. 2605-11 High Performance Organic Coatings on Architectural Extrusions and Panels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: ASTM A167, Type 302B.
- B. Aluminum, Extruded: ASTM B221/B221M.
- C. Aluminum Sheet: ASTM B209/B209M.

2.2 EQUIPMENT SUPPORTS

- A. Form exterior curb with integral base and deck closures for curbs installed on steel decking.

2.3 FINISH

- A. In accordance with NAAMM Amp 500 Series.
- B. Stainless Steel: Finish No. 2B or 2D.
- C. Aluminum, Mill Finish: AA-MIX, as fabricated.

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PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install roof specialties where shown or required.
- 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 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 600 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 100 mm (4 inches).
- F. Equipment Supports: Do not anchor to insulating concrete or metal deck. Anchor only to building structure as per manufacturer's 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 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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3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 07 84 00**FIRESTOPPING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Closures of openings in walls, floors, and roof decks against penetration of flame, heat, and smoke or gases in fire resistant rated construction.
- B. Closure of openings in walls against penetration of gases or smoke in smoke partitions.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- C. Fire and smoke damper assemblies in ductwork: Section 23 31 00, HVAC DUCTS AND CASINGS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's literature, data, and installation instructions for types of firestopping and smoke stopping used.
- C. List of FM, UL, or WH classification number of systems installed.
- D. Certified laboratory test reports for ASTM E814 tests for systems not listed by FM, UL, or WH proposed for use.

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 WARRANTY

- A. Firestopping work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend the warranty period to five years.

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1.6 QUALITY ASSURANCE

- A. FM, UL, or WH or other approved laboratory tested products will be acceptable.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. E84-10 Surface Burning Characteristics of Building Materials
 - 2. E814-11 Fire Tests of Through-Penetration Fire Stops
- C. Factory Mutual Engineering and Research Corporation (FM):
 - 1. Annual Issue Approval Guide Building Materials
- D. Underwriters Laboratories, Inc. (UL):
 - 1. Annual Issue Building Materials Directory
 - 2. Annual Issue Fire Resistance Directory
 - 3. 1479-10 Fire Tests of Through-Penetration Firestops
- E. Warnock Hersey (WH):
 - 1. Annual Issue Certification Listings

PART 2 - PRODUCTS**2.1 FIRESTOP SYSTEMS**

- A. Use 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.
- 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 100 mm (4 in) nominal pipe or 0.01 m² (16 sq. in.) in overall cross sectional area.
- C. Products requiring heat activation to seal an opening by its intumescence shall exhibit a demonstrated ability to function as designed to maintain the fire barrier.
- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
 - 1. Contain no flammable or toxic solvents.

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2. Have 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 used in exposed areas, shall be capable of being sanded and finished with similar surface treatments as used on the surrounding wall or floor surface.
- E. Firestopping system or devices used for penetrations by glass pipe, plastic pipe or conduits, unenclosed cables, or other non-metallic materials shall 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.
 3. Intumescent products which would expand to seal the opening and act as fire, smoke, toxic fumes, and, water sealant.
- F. Maximum flame spread of 25 and smoke development of 50 when tested in accordance with ASTM E84.
- G. FM, UL, or WH rated or tested by an approved laboratory in accordance with E814.
- H. Materials to be asbestos free.

2.2 SMOKE STOPPING IN SMOKE PARTITIONS

- A. Use silicone sealant in smoke partitions as specified in Section 07 92 00, JOINT SEALANTS.
- B. Use mineral fiber filler and bond breaker behind sealant.
- C. Sealants shall have a maximum flame spread of 25 and smoke developed of 50 when tested in accordance with 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.

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3.2 PREPARATION

- A. Remove dirt, grease, oil, 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 either 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.

3.3 INSTALLATION

- A. Do not begin 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 AND ACCEPTANCE OF WORK

- A. As work on each floor is completed, remove materials, litter, and debris.
- B. Do not move materials and equipment to the next-scheduled work area until completed work is inspected and accepted by the Contracting Officer's Representative.
- C. Clean up spills of liquid type materials.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 07 92 00**JOINT SEALANTS****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Section covers all sealant and caulking materials and their application, wherever required for complete installation of building materials or systems.

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- C. Glazing: Section 08 80 00, GLAZING.
- D. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- E. Mechanical Work: Section 21 05 11, COMMON WORK RESULTS FOR FIRE SUPPRESSION, Section 22 05 11, COMMON WORK RESULTS FOR PLUMBING, Section 23 05 11, COMMON WORK RESULTS FOR HVAC AND STEAM GENERATION.

1.3 QUALITY CONTROL:

- A. Installer Qualifications: An experienced installer 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.
- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Product Testing: Obtain test results from a qualified testing agency based on testing current sealant formulations within a 12-month period.
 - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021.
 - 2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 - 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 - 4. Test other joint sealants for compliance with requirements indicated

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by referencing standard specifications and test methods.

- D. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to joint substrates in accordance with sealant manufacturer's recommendations:
 - 1. Locate test joints where indicated or, if not indicated, as directed by Contracting Officer.
 - 2. Conduct field tests for each application indicated below:
 - a. Each type of elastomeric sealant and joint substrate indicated.
 - b. Each type of non-elastomeric sealant and joint substrate indicated.
 - 3. Notify Contracting Officer's Representative seven days in advance of dates and times when test joints will be erected.
 - 4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
- E. VOC: Acrylic latex and Silicon sealants shall have less than 50g/l VOC content.
- F. Mockups: Before installing joint sealants, apply elastomeric sealants as follows to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution:
 - 1. Joints in mockups of assemblies specified in other Sections that are indicated to receive elastomeric joint sealants, which are specified by reference to this section.

1.4 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's installation instructions for each product used.
- C. Cured samples of exposed sealants for each color where required to match adjacent material.
- D. Manufacturer's Literature and Data:
 - 1. Caulking compound
 - 2. Primers
 - 3. Sealing compound, each type, including compatibility when different sealants are in contact with each other.

1.5 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°C

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(40°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.

1.6 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°C (90°F) or less than 5°C (40°F).

1.7 DEFINITIONS:

- A. Definitions of terms in accordance with ASTM C717 and as specified.
- B. Back-up 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.

1.8 WARRANTY:

- A. Warranty exterior sealing against leaks, adhesion, and cohesive failure, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to two years.
- B. General Warranty: Special warranty specified in this Article shall not deprive Government of other rights Government may have under other provisions of Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of Contract Documents.

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 Society for Testing and Materials (ASTM):

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1. C509-06 Elastomeric Cellular Preformed Gasket and Sealing Material.
2. C612-10 Mineral Fiber Block and Board Thermal Insulation.
3. C717-10 Standard Terminology of Building Seals and Sealants.
4. C834-10 Latex Sealants.
5. C919-08. Use of Sealants in Acoustical Applications.
6. C920-10 Elastomeric Joint Sealants.
7. C1021-08 Laboratories Engaged in Testing of Building Sealants.
8. C1193-09 Standard Guide for Use of Joint Sealants.
9. C1330-02 (R2007) Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
10. D1056-07 Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
11. E84-09 Surface Burning Characteristics of Building Materials.

C. Sealant, Waterproofing and Restoration Institute (SWRI).

D. The Professionals' Guide.

PART 2 - PRODUCTS**2.1 SEALANTS:****A. S-1:**

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 20-40

B. S-2:

1. ASTM C920, polyurethane or polysulfide.
2. Type M.
3. Class 25.
4. Grade P.
5. Shore A hardness of 25-40.

C. S-3:

1. ASTM C920, polyurethane or polysulfide.

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2. Type S.
 3. Class 25, joint movement range of plus or minus 50 percent.
 4. Grade NS.
 5. Shore A hardness of 15-25.
 6. Minimum elongation of 700 percent.
- D. S-4:
1. ASTM C920 polyurethane or polysulfide.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-40
- E. S-6:
1. ASTM C920, silicone, neutral cure.
 2. Type S.
 3. Class: Joint movement range of plus 100 percent to minus 50 percent.
 4. Grade NS.
 5. Shore A hardness of 15-20.
 6. Minimum elongation of 1200 percent.
- F. S-7:
1. ASTM C920, silicone, neutral cure.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-30.
 6. Structural glazing application.
- G. S-8:
1. ASTM C920, silicone, acetoxo cure.
 2. Type S.
 3. Class 25.
 4. Grade NS.
 5. Shore A hardness of 25-30.
 6. Structural glazing application.
- H. S-9:
1. ASTM C920 silicone.

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2. Type S.
3. Class 25.
4. Grade NS.
5. Shore A hardness of 25-30.
6. Non-yellowing, mildew resistant.

I. S-11:

1. ASTM C920 polyurethane.
2. Type M/S.
3. Class 25.
4. Grade P/NS.
5. Shore A hardness of 35 to 50.

J. S-12:

1. ASTM C920, polyurethane.
2. Type M/S.
3. Class 25, joint movement range of plus or minus 50 percent.
4. Grade P/NS.
5. Shore A hardness of 25 to 50.

2.2 CAULKING COMPOUND:

- A. C-1: ASTM C834, acrylic latex.
- B. C-2: One component acoustical caulking, non drying, non hardening, synthetic rubber.

2.3 COLOR:

- A. Sealants used with exposed masonry shall match color of mortar joints.
- B. Sealants used with unpainted concrete shall match color of adjacent concrete.
- C. Color of sealants for other locations shall be light gray or aluminum, unless specified otherwise. Or, as directed by the Contracting Officer's Representative.
- D. Caulking shall be light gray or white, unless specified otherwise, or as directed by the Contracting Officer's Representative.

2.4 JOINT SEALANT BACKING:

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

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- 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, nonabsorbent to water and gas, and capable of remaining resilient at temperatures down to minus 32°C (minus 26°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 fiber board: 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 POUROUS SURFACES:

- A. Chemical cleaners acceptable to manufacturer of sealants and sealant backing material, 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.

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3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- 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 the following:
 - a. Concrete.
 - b. 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.
 - a. Metal.
 - b. Glass.
 - c. Glazed surfaces of ceramic tile.
- C. Do not cut or damage joint edges.
- D. Apply 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.
 - 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.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

3.3 BACKING INSTALLATION:

- A. Install back-up 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 back-up rod and position the rod at proper depth.

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- C. Cut fillers installed by others to proper depth for installation of back-up rod and sealants.
- D. Install back-up 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 back-up rod does not exist, install bond breaker tape strip at bottom (or back) of joint so sealant bonds only to two opposing surfaces.
- F. Take all necessary steps to prevent three sided adhesion of sealants.

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 deg C and 38 deg C (40 deg and 100 deg F).
 - 2. Do not use 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 use 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 joints to concave surface unless shown or specified otherwise.
 - 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.
- B. For application of sealants, follow requirements of ASTM C1193 unless specified otherwise.
- C. 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

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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 cut-outs 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:

- A. Field-Adhesion Testing: Field-test joint-sealant adhesion to joint substrates as recommended by sealant manufacturer:
 1. Extent of Testing: Test completed elastomeric sealant joints as follows:
 - a. Perform 10 tests for first 300 m (1000 feet) of joint length for each type of elastomeric sealant and joint substrate.
 - b. Perform one test for each 300 m (1000 feet) of joint length thereafter or one test per each floor per elevation.
- B. Inspect joints for complete fill, for absence of voids, and for joint configuration complying with specified requirements. Record results in a field adhesion test log.
- C. Inspect tested joints and report on following:
 1. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each type of product and joint substrate.
 2. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 3. Whether sealants filled joint cavities and are free from voids.
 4. Whether sealant dimensions and configurations comply with specified requirements.
- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure

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from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by the caulking or sealant manufacturer.
- B. After filling and finishing joints, remove masking tape.
- C. Leave adjacent surfaces in a clean and unstained condition.

3.8 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

3.9 LOCATIONS:

- A. Exterior Building Joints, Horizontal and Vertical:
 - 1. Metal to Metal: Type S-1, S-2
 - 2. Metal to Concrete or Terracotta: Type S-1
 - 3. Threshold Setting Bed: Type S-1, S-3, S-4
- B. Metal Reglets and Flashings:
 - 1. Flashings to Wall: Type S-6
 - 2. Metal to Metal: Type S-6
- C. Sanitary Joints:
 - 1. Walls to Plumbing Fixtures: Type S-9
 - 2. Counter Tops to Walls: Type S-9
 - 3. Pipe Penetrations: Type S-9
- D. Horizontal Traffic Joints:
 - 1. Concrete Paving, Unit Pavers: Type S-11 or S-12
- E. High Temperature Joints over 204 degrees C (400 degrees F):
 - 1. Exhaust Pipes, Flues, Breech Stacks: Type S-7 or S-8
- F. Interior Caulking:

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1. Typical Narrow Joint 6 mm, (1/4 inch) or less at Walls and Adjacent Components: Types C-1 and C-2.
2. Perimeter of Doors, Windows, Access Panels which Adjoin Concrete or Masonry Surfaces: Types C-1 and C-2.
3. Perimeter of Lead Faced Control Windows and Plaster or Gypsum Wallboard Walls: Types C-1 and C-2.
4. Exposed Isolation Joints at Top of Full Height Walls: Types C-1 and C-2.
5. Exposed Acoustical Joint at Sound Rated Partitions Type C-2.
6. Concealed Acoustic Sealant Type S-4, C-1, and C-2.

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SECTION 08 11 13**HOLLOW METAL DOORS AND FRAMES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies steel doors, steel frames and related components.
- B. Terms relating to steel doors and frames as defined in ANSI A123.1 and as specified.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.
- C. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- D. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- E. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- F. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL.
- G. Intrusion Alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM.
- H. Security Monitors: Section 28 51 00, SECURITY CONTROL CENTER.

1.3 TESTING

- A. An independent testing laboratory shall perform testing.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturers Literature and Data:
 - 1. Fire rated doors and frames, showing conformance with NFPA 80 and Underwriters Laboratory, Inc., or Intertek Testing Services or Factory Mutual fire rating requirements .
 - 2. Sound rated doors, including test report from Testing Laboratory.

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1.5 SHIPMENT

- A. Prior to shipment label each door and frame to show location, size, door swing and other pertinent information.
- B. Fasten temporary steel spreaders across the bottom of each door frame.

1.6 STORAGE AND HANDLING

- A. Store doors and frames at the site under cover.
- B. Protect from rust and damage during storage and erection until completion.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - 1. L-S-125B Screening, Insect, Nonmetallic
- C. Door and Hardware Institute (DHI):
 - 1. A115 Series Steel Door and Frame Preparation for Hardware, Series A115.1 through A115.17 (Dates Vary)
- D. Steel Door Institute (SDI):
 - 1. 113-01 Thermal Transmittance of Steel Door and Frame Assemblies
 - 2. 128-1997 Acoustical Performance for Steel Door and Frame Assemblies
 - 3. A250.8-03 Standard Steel Doors and Frames
- E. American Society for Testing and Materials (ASTM):
 - 1. A167-99(R2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 2. A568/568-M-07 Steel, Sheet, Carbon, and High-Strength, Low-alloy, Hot-Rolled and Cold-Rolled
 - 3. A1008-08 Steel, sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy and High Strength Low Alloy with Improved Formability
 - 4. B209/209M-07 Aluminum and Aluminum-Alloy Sheet and Plate
 - 5. B221/221M-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles and Tubes
 - 6. D1621-04 Compressive Properties of Rigid Cellular Plastics
 - 7. D3656-07 Insect Screening and Louver Cloth Woven from Vinyl Coated Glass Yarns
 - 8. E90-04 Laboratory Measurement of Airborne Sound

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Transmission Loss of Building Partitions

- F. The National Association Architectural Metal Manufacturers (NAAMM):
 - 1. Metal Finishes Manual (1988 Edition)
- G. National Fire Protection Association (NFPA):
 - 1. 80-09 Fire Doors and Fire Windows
- H. Underwriters Laboratories, Inc. (UL):
 - 1. Fire Resistance Directory
- I. Intertek Testing Services (ITS):
 - 1. Certifications Listings...Latest Edition
- J. Factory Mutual System (FM):
 - 1. Approval Guide

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Sheet Steel: ASTM A1008, cold-rolled for panels (face sheets) of doors.
- B. Anchors, Fastenings and Accessories: Fastenings anchors, clips connecting members and sleeves from zinc coated steel.
- C. Prime Paint: Paint that meets or exceeds the requirements of A250.8.

2.2 FABRICATION, GENERAL

- A. GENERAL:
 - 1. Follow SDI A250.8 for fabrication of standard steel doors, except as specified otherwise. Doors to receive hardware specified in Section 08 71 00, DOOR HARDWARE. Tolerances as per SDI A250.8. Thickness, 44 mm (1-3/4 inches), unless otherwise shown.
 - 2. Close top edge of exterior doors flush and seal to prevent water intrusion.
 - 3. When vertical steel stiffeners are used for core construction, fill spaces between stiffeners with mineral fiber insulation.
- B. Heavy Duty Doors: SDI A250.8, Level 2, Model 2 of size and design shown. Core construction types a, d, or f, for interior doors, and, types b, c, e, or f, for exterior doors.
- C. Extra Heavy Duty Doors: SDI A250.8, Level 3, Model 2 of size and design shown. Core construction Types d or f, for interior doors, and Types b, c, e, or f, for exterior doors. Use for detention doors, stairwell doors and security doors. See additional requirements for detention doors, under paragraph "Custom Hollow Metal Doors.

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D. Fire Rated Doors (Labeled):

1. Conform to NFPA 80 when tested by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual for the class of door or door opening shown.
2. Fire rated labels of metal, with raised or incised markings of approving laboratory shall be permanently attached to doors.
3. Close top and vertical edges of doors flush. Vertical edges shall be seamless. Apply steel astragal to the meeting stile of the active leaf of pairs of fire rated doors, except where vertical rod exit devices are specified for both leaves swinging in the same direction.
4. Construct fire rated doors in stairwell enclosures for maximum transmitted temperature rise of 230° C (450° F) above ambient temperature at end of 30 minutes of fire exposure when tested in accordance with ASTM E152.

E. Sound Rated Doors:

1. SDI 114, except as specified otherwise.
2. Sound Transmission Class minimum of 45 when tested in accordance with ASTM E90.
3. Doors complete with integral spring type automatic door bottom seal and with integral continuous gaskets on the frames. Applied spring type automatic door bottom seal and applied continuous gaskets for the frames for doors that are not sound rated but sealed for flanking noises are specified in Section 08 71 00, DOOR HARDWARE.
4. Fabricate vision panels to receive double glazing where shown.

2.3 METAL FRAMES

A. General:

1. SDI A250.8, 1.3 mm (0.053 inch) thick sheet steel, types and styles as shown or scheduled.
2. Frames for labeled fire rated doors .
 - a. Comply with NFPA 80. Test by Underwriters Laboratories, Inc., Inchcape Testing Services, or Factory Mutual.
 - b. Fire rated labels of approving laboratory permanently attached to frames as evidence of conformance with these requirements. Provide labels of metal or engraved stamp, with raised or incised

B. Reinforcement and Covers:

1. SDI A250.8 for, minimum thickness of steel reinforcement welded to back of frames.
2. Provide mortar guards securely fastened to back of hardware reinforcements except on lead-lined frames.
3. Where concealed door closers are installed within the head of the door frames, prepare frames for closers and provide 1 mm (0.042 inch) thick steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.

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C. Glazed Openings :

1. Integral stop on corridor, or secure side of door.
2. Design rabbet width and depth to receive glazing material or panel shown or specified.

D. Frame Anchors:

1. Floor anchors:

- a. Where floor fills occur, provide extension type floor anchors to compensate for depth of fill.
- b. At bottom of jamb use 1.3 mm (0.053 inch) thick steel clip angles welded to jamb and drilled to receive two 6 mm (1/4 inch) floor bolts. Use 50 mm x 50 mm (2 inch by 2 inch) 9 mm (3/8 inch) clip angle for lead lined frames, drilled for 9 mm (3/8 inch) floor bolts.
- c. Where mullions occur, provide 2.3 mm (0.093 inch) thick steel channel anchors, drilled for two 6 mm (1/4 inch) floor bolts and frame anchor screws.
- d. Where sill sections occur, provide continuous 1 mm (0.042 inch) thick steel rough bucks drilled for 6 mm (1/4 inch) floor bolts and frame anchor screws. Space floor bolts at 50 mm (2 inches) on center.

2. Jamb anchors:

- a. Locate anchors on jambs near top and bottom of each frame, and at intermediate points not over 600 mm (24 inches) apart, except for fire rated frames space anchors as required by labeling authority.
- b. Form jamb anchors of not less than 1 mm (0.042 inch) thick steel unless otherwise specified.
- c. Anchors set in masonry: Use adjustable anchors designed for friction fit against the frame and for extension into the masonry not less than 250 mm (10 inches). Use one of following type:
 - 1) Wire loop type of 5 mm (3/16 inch) diameter wire.
 - 2) T-shape or strap and stirrup type of corrugated or perforated sheet steel.
- d. Anchors for stud partitions: Either weld to frame or use lock-in snap-in type. Provide tabs for securing anchor to the sides of the studs.
- e. Anchors for frames set in prepared openings:
 - 1) Steel pipe spacers with 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.
 - 2) Drill jamb stop and strap spacers for 6 mm (1/4 inch) flat head bolts to pass thru frame and spacers.
 - 3) Two piece frames: Subframe or rough buck drilled for 6 mm (1/4 inch) bolts.
- f. Anchors for continuous frames set in stud partitions.
 - 1) In addition to jamb anchors, weld clip anchors to sills and heads of continuous frames over 1200 mm (4 feet) long.

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- 2) Anchors spaced 600 mm (24 inches) on centers maximum.
- g. Modify frame anchors to fit special frame and wall construction and provide special anchors where shown or required.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Plumb, align and brace frames securely 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 if the shipping spreader is removed.
 - 3. Protect frame from accidental abuse.
 - 4. Where construction will permit concealment, leave the shipping spreaders in place after installation, otherwise remove the spreaders after the frames are set and anchored.
 - 5. Remove wood spreaders and braces only after the walls are built and jamb anchors are secured.
- B. Floor Anchors:
 - 1. Anchor the bottom of door frames to floor with two 6 mm (1/4 inch) diameter expansion bolts. Use 9 mm (3/8 inch) bolts on lead lined frames.
 - 2. Power actuated drive pins may be used to secure frame anchors to concrete floors.
- C. Jamb Anchors:
 - 1. Anchors in masonry walls: Embed anchors in mortar. Fill space between frame and masonry wall with grout or mortar as walls are built.
 - 2. Coat frame back with a bituminous coating prior to lining of grout filling in masonry walls.
 - 3. Secure anchors to sides of studs with two fasteners through anchor tabs. Use steel drill screws to steel studs.
 - 4. Frames set in prepared openings of masonry or concrete: Expansion bolt to wall with 6 mm (1/4 inch) expansion bolts through spacers. Where subframes or rough bucks are used, 6 mm (1/4 inch) expansion bolts on 600 mm (24 inch) centers or power activated drive pins 600 mm (24 inches) on centers. Secure two piece frames to subframe or rough buck with machine screws on both faces.
- D. Install anchors for labeled fire rated doors to provide rating as required.
- E. Frames for Sound Rated Doors: Coordinate to line frames for sound rated doors with insulation.

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3.2 INSTALLATION OF DOORS AND APPLICATION OF HARDWARE

- A. Install doors and hardware as specified in Sections Section 08 71 00, DOOR HARDWARE.

3.3 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 08 14 00**INTERIOR WOOD DOORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies interior flush doors with prefinish, prefit option.
- B. Section includes non-rated, fire rated doors, sound retardant and smoke doors.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- C. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- D. Installation of doors and hardware: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, Section 08 14 00, INTERIOR WOOD DOORS, or Section 08 71 00, DOOR HARDWARE.
- E. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- F. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- G. Card readers and biometric devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS
- H. Intrusion alarm: Section 28 16 00, INTRUSION DETECTION SYSTEM

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. 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 (8 inch) by 275 mm (11 inch) by 6 mm (1/4 inch) showing specified wood species sanded to receive a transparent finish. Factory finish veneer sample where the prefinished option is accepted.
- C. Shop Drawings:

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1. Show every door in project and schedule location in building.
2. Indicate type, grade, finish and size; include detail of glazing, sound gasketing and pertinent details. All doors to receive sound gasketing.
3. Provide information concerning specific requirements not included in the manufacturer's literature and data submittal.

D. Manufacturer's Literature and Data:

1. Sound rated doors, including test report indicating STC rating per ASTM E90 from test laboratory.
2. Labeled fire rated doors showing conformance with NFPA 80.

E. Laboratory Test Reports:

1. Screw holding capacity test report in accordance with WDMA T.M.10.
2. Split resistance test report in accordance with WDMA T.M.5.
3. Cycle/Slam test report in accordance with WDMA T.M.7.
4. Hinge-Loading test report in accordance with WDMA T.M.8.

1.4 WARRANTY

- A. Doors are subject to terms of Article titled "Warranty of Construction", FAR clause 52.246-21, except that warranty shall be as follows:
1. For interior doors, manufacturer's warranty for lifetime of original installation.
 2. Specified STC RATING for sound retardant rated door assembly in place.

1.5 DELIVERY AND STORAGE

- A. Factory seal doors and accessories in minimum of 6 mill polyethylene bags or cardboard packages which shall remain unbroken during delivery and storage.
- B. Store in accordance with WDMA I.S.1-A, J-1 Job Site Information.
- C. Label package for door opening where used.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. Window and Door Manufacturers Association (WDMA):
1. I.S.1-A-04 Architectural Wood Flush Doors
 2. I.S.4-07A Water-Repellent Preservative Non-Pressure Treatment for Millwork
 3. I.S.6A-01 Architectural Wood Stile and Rail Doors
 4. T.M.5-90 Split Resistance Test Method

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5. T.M.6-08 Adhesive (Glue Bond) Durability Test Method
 6. T.M.7-08 Cycle-Slam Test Method
 7. T.M.8-08 Hinge Loading Test Method
 8. T.M.10-08 Screwholding Test Method
- C. National Fire Protection Association (NFPA):
1. 80-07 Protection of Buildings from Exterior Fire
 2. 252-08 Fire Tests of Door Assemblies
- D. ASTM International (ASTM):
1. E90-04 Laboratory Measurements of Airborne Sound Transmission Loss

PART 2 - PRODUCTS**2.1 FLUSH DOORS**

- A. General:
1. Meet requirements of WDMA I.S.1-A, Extra Heavy Duty.
 2. Adhesive: Type II
 3. Thickness: 45 mm (1-3/4 inches) unless otherwise shown or specified.
 4. Give exposed wood parts of exterior doors a water-repellent preservative treatment in accordance with WDMA I.S.4.
- B. Face Veneer:
1. In accordance with WDMA I.S.1-A.
 2. One species throughout the project unless scheduled or otherwise shown.
 3. For transparent finishes: Premium Grade, rotary cut, white maple.
 - a. Match existing doors in building.
 - b. A grade face veneer standard optional.
 - c. AA grade face veneer
 - d. Match face veneers for doors for uniform effect of color and grain at joints.
 - e. Door edges shall be same species as door face veneer except maple may be used for stile face veneer on birch doors.
 - f. On doors required to have transparent finish on one side and paint finish on other side; use veneers as required for transparent finish on both sides.
 - g. In existing buildings, where doors are required to have transparent finish, use wood species and grade of face veneers to match adjacent existing doors.
 4. For painted finishes: Custom Grade, mill option close grained hardwood, premium or medium density overlay. Do not use Lauan.

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5. Factory sand doors for finishing.
- C. Wood for stops, louvers, muntins and moldings of flush doors required to have transparent finish:
1. Solid Wood of same species as face veneer, except maple may be used on birch doors.
 2. Glazing:
 - a. On non-labeled doors use applied wood stops nailed tight on room side and attached on opposite side with flathead, countersunk wood screws, spaced approximately 125 mm (5 inches) on centers.
 - b. Use stainless steel or dull chrome plated brass screws for exterior doors.
 3. Wood Louvers:
 - a. Door manufacturer's standard product, fabricated of solid wood sections.
 - b. Wood Slats: Not less than 5 mm (3/16 inch) thick.
 - c. Stiles routed out to receive slats.
 - d. Secure louvers in prepared cutouts with wood stops.
- D. Fire rated wood doors:
1. Fire Performance Rating:
 - a. "B" label, 1-1/2 hours.
 - b. "C" label, 3/4 hour.
 2. Labels:
 - a. Doors shall conform to the requirements of ASTM E2074, or NFPA 252, and, carry an identifying label from a qualified testing and inspection agency for class of door or opening shown designating fire performance rating.
 - b. Metal labels with raised or incised markings.
 3. Performance Criteria for Stiles of doors utilizing standard mortise leaf hinges:
 - a. Hinge Loading: WDMA T.M.8. Average of 10 test samples for Extra Heavy Duty doors.
 - b. Direct screw withdrawal: WDMA T.M.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 in accordance with WDMA T.M.7.
 4. Additional Hardware Reinforcement:
 - a. Provide fire rated doors with hardware reinforcement blocking.
 - b. Size of lock blocks as required to secure hardware specified.
 - c. Top, bottom and intermediate rail blocks shall measure not less than 125 mm (five inches) minimum by full core width.
 - d. Reinforcement blocking in compliance with manufacturer's labeling requirements.

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- e. Mineral material similar to core is not acceptable.
- 5. Other Core Components: Manufacturer's standard as allowed by the labeling requirements.
- 6. Provide steel frame approved for use in labeled doors for vision panels.
- 7. Provide steel astragal on pair of doors.
- E. Smoke Barrier Doors:
 - 1. For glazed openings use steel frames approved for use in labeled doors.
 - 2. Provide a steel astragal on one leaf of pairs of doors, including double egress doors.
- F. Sound Rated Doors:
 - 1. Fabricated as specified for flush wood doors with additional construction requirements to meet specified sound transmission class (STC).
 - 2. STC Rating of the door assembly in place when tested in accordance with ASTM E90 by an independent nationally recognized acoustical testing laboratory not less than 36. STC shall be minimum 42 at perimeter doors and private offices/consult rooms, when installed with appropriate door seals.
 - 3. Accessories:
 - a. Frame Gaskets: Continuous closed cell sponge neoprene with stop adjusters.
 - b. Automatic Door Bottom Seal:
 - 1) Steel spring operated, closed cell sponge neoprene metal mounted removable in extruded aluminum housing with a medium matte 0.1 mm (4.0 mil) thick clear Anodized finish.
 - 2) Concealed or Surface Mounted.

2.2 PREFINISH, PREFIT OPTION

- A. Flush doors may be factory machined to receive hardware, bevels, undercuts, cutouts, accessories and fitting for frame.
- B. Factory fitting to conform to specification for shop and field fitting, including factory application of sealer to edge and routings.
- C. Flush doors to receive transparent finish (in addition to being prefit may be factory finished as follows:
 - 1. WDMA I.S.1-A Section F-3 specification for System TR-4, Conversion Varnish or System TR-5, Catalyzed Vinyl.
 - 2. Use stain when required to produce the finish specified in Section 09 06 00 SCHEDULE FOR FINISHES.

2.3 IDENTIFICATION MARK:

- A. On top edge of door.

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- B. Either a stamp, brand or other indelible mark, giving manufacturer's name, door's trade name, construction of door, code date of manufacture and quality.
- C. Accompanied by either of the following additional requirements:
 - 1. An identification mark or a separate certification including name of inspection organization.
 - 2. Identification of standards for door, including glue type.
 - 3. Identification of veneer and quality certification.
 - 4. Identification of preservative treatment for stile and rail doors.

2.4 SEALING:

- A. Give top and bottom edge of doors two coats of catalyzed polyurethane or water resistant sealer before sealing in shipping containers.

PART 3 - EXECUTION**3.1 DOOR PREPARATION**

- A. Field, shop or factory preparation: Do not violate the qualified testing and inspection agency label requirements for fire rated doors.
- B. Clearances between Doors and Frames and Floors:
 - 1. 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. Maximum clearance at bottom of sound rated doors, light-proofed doors, doors to operating rooms, and doors designated to be fitted with mechanical seal: 10 mm (3/8 inch).
- C. Provide cutouts for special details required and specified.
- D. Rout doors for hardware using templates and location heights specified in Section, 08 71 00 DOOR HARDWARE.
- E. Fit doors to frame, bevel lock edge of doors 3 mm (1/8 inch) for each 50 mm (2 inches) of door thickness, undercut as allowed by NFPA 80 or as directed by Contracting Officer's Representative.
- F. Immediately after fitting and cutting of doors for hardware, seal cut edges of doors with two coats of water resistant sealer.
- G. Finish surfaces, including both faces, top and bottom and edges of the doors smooth to touch.
- H. Apply a steel astragal on the opposite side of active door on pairs of fire rated doors.
- I. Apply a steel astragal to meeting stile of active leaf of pair of doors

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or double egress smoke doors.

3.2 INSTALLATION OF DOORS APPLICATION OF HARDWARE

- A. Install doors and hardware as specified in this Section.

3.3 DOOR PROTECTION

- A. As door installation is completed, place polyethylene bag or cardboard shipping container over door and tape in place.
- B. Provide protective covering over knobs and handles in addition to covering door.
- C. Maintain covering in good condition until removal is approved by Contracting Officer's Representative.

3.4 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 08 31 13**ACCESS DOORS AND FRAMES****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Section specifies access doors or panels.

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Wire mesh and screen access doors: Section 05 50 00, METAL FABRICATIONS.
- C. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- D. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.
- E. Access doors in gypsum board walls and ceilings: Section 092900, GYPSUM BOARD; and SECTION 092216, NON-STRUCTURAL METAL FRAMING.
- F. Locations of access doors for duct work cleanouts: Section 23 31 00, HVAC DUCTS AND CASINGS; Section 23 37 00, AIR OUTLETS AND INLETS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Access doors, each type, showing construction, location and installation details.
- C. Manufacturer's Literature and Data: Access doors, each type.

1.4 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 Society for Testing and Materials (ASTM):
 - 1. A167-99(R-2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - 2. A1008-10 Steel Sheet, Cold-Rolled, Carbon, Structural, High Strength Low-Alloy
- C. American Welding Society (AWS):

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1. D1.3-08 Structural Welding Code Sheet Steel
- D. National Fire Protection Association (NFPA):
 1. 80-10 Fire Doors and Windows
- E. The National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500 Series Metal Finishes Manual
- F. Underwriters Laboratories, Inc. (UL):
 1. Fire Resistance Directory

PART 2 - PRODUCTS**2.1 FABRICATION, GENERAL**

- A. Fabricate components to be straight, square, flat and in same plane where required.
 1. Slightly round exposed edges and without burrs, snags and sharp edges.
 2. Exposed welds continuous and ground smooth.
 3. Weld in accordance with AWS D1.3.
- B. Number of locks and non-continuous hinges as required to maintain alignment of panel with frame. For fire rated doors, use hinges and locks as required by fire test.
- C. Provide anchors or make provisions in frame for anchoring to adjacent construction. Provide size, number and location of anchors on four sides to secure access door in opening. Provide anchors as required by fire test.

2.2 ACCESS DOORS, FIRE RATED:

- A. Shall meet requirements for "B" label 1-1/2 hours with maximum temperature rise of 120 degree C (250 degrees F).
- B. Comply with NFPA 80 and have Underwriters Laboratories Inc., or other nationally recognized laboratory label for Class B opening.
- C. Door Panel: Form of 0.9 mm (0.0359 inch) thick steel sheet, insulated sandwich type construction.
- D. Frame: Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed. Provide frame flange at perimeter where installed in concrete masonry or gypsum board openings.
 1. Weld exposed joints in flange and grind smooth.
 2. Provide frame flange at perimeter where installed in concrete masonry or gypsum board.
 3. Provide expanded galvanized metal lath perimeter wings when installed

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in plaster except veneer plaster.

- E. Automatic Closing Device: Provide automatic closing device for door.
- F. Hinge: Continuous steel hinge with stainless steel pin.
- G. Lock:
 - 1. Self-latching, with provision for fitting flush a standard screw-in type lock cylinder. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.
 - 2. Provide latch release device operable from inside of door. Mortise case in door.

2.3 ACCESS DOORS, FLUSH PANEL:

- A. System Description:
 - 1. Provide glass fiber reinforced access panels for ceiling installation, with accessories.
- B. Panels: Provide glass fiber reinforced plaster "GRP" or "FG" lay-in access panels, with frame designed to be installed into gypsum board ceiling installation with frame taped to adjacent gypsum board ceiling.
 - 1. Provide access panel assemblies consisting of an integral unit, complete and ready for installation with panels flush with finished ceiling, field painted to match ceiling.
 - 2. Provide type with frame flange concealed in finished construction.
- C. Hinge:
 - 1. Provide type with frame flange concealed in finished construction.
- D. Lock:
 - 1. Flush, screwdriver operated cam lock.

2.4 FINISH:

- A. Provide in accordance with NAAMM AMP 500 series on exposed surfaces.
- B. Steel Surfaces: Baked-on prime coat over a protective phosphate coating.
- C. Stainless Steel: No. 4 for exposed surfaces.

2.5 SIZE:

- A. Size Variations: Manufacturer's standard size units which may vary slightly from sizes shown or scheduled Minimum 600 mm (24 inches) square door unless otherwise shown to suit opening in suspension system of ceiling.

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PART 3 - EXECUTION**3.1 LOCATION:**

- A. Provide access panels or doors wherever any valves, traps, dampers, cleanouts, and other control items of mechanical, electrical and conveyor work are concealed in wall or partition, or are above ceiling of gypsum board or plaster.
- B. Use fire rated doors in fire rated partitions and ceilings.
- C. Use flush panels in partitions and gypsum board or plaster ceilings, except lay-in acoustical panel ceilings or upward access acoustical tile ceilings.
- D. Use stainless steel panels in wet locations such as restrooms, utility rooms and similar locations.

3.2 INSTALLATION, GENERAL:

- A. Install access doors in openings to have sides vertical in wall installations, and parallel to ceiling suspension grid or side walls when installed in ceiling.
- B. Set frames so that edge of frames without flanges will finish flush with surrounding finish surfaces.
- C. Set frames with flanges to overlap opening and so that face will be uniformly spaced from the finish surface.
- D. Set recessed panel access doors recessed so that face of surrounding materials will finish on the same plane, when finish in door is installed.

3.3 ANCHORAGE:

- A. Secure frames to adjacent construction using anchors attached to frames or by use of bolts or screws through the frame members.
- B. Type, size and number of anchoring device suitable for the material surrounding the opening, maintain alignment, and resist displacement during normal use of access door.
- C. Anchors for fire rated access doors shall meet requirements of applicable fire test.

3.4 ADJUSTMENT:

- A. Adjust hardware so that door panel will open freely.
- B. Adjust door when closed so door panel is centered in the frame.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

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- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 08 41 13**ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies interior aluminum door and sidelight work including interior storefront construction, hung doors and other components to make a complete assembly.

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Glass and Glazing: Section 08 80 00, GLAZING.
- C. Hardware: Section 08 71 00, DOOR HARDWARE.
- D. Automatic Door Operators: Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS.
- E. Texture and color of finish: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: (1/2 full scale) showing construction, design loading, anchorage, reinforcement, and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Doors, each type.
 - 2. Entrance and Storefront construction.
 - 3. Calculated design loads with member capacities and deflections.
- D. Samples:
 - 1. Door corner section, 450 mm x 450 mm (18 x 18 inches), of each door type specified, showing vertical and top hinge edges, door closer reinforcement internal reinforcement.
 - 2. Two samples of anodized aluminum of each color showing finish and maximum shade range.
 - 3. Two samples of organic finish of each color specified.
- E. Manufacturer's Certificates:

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1. Stating that aluminum has been given specified thickness of anodizing.
2. Indicating manufacturer's qualifications specified.

1.4 QUALITY ASSURANCE:

- A. Approval by Contracting Officer's Representative is required of products of proposed manufacturer, or supplier, and will be based upon submission by Contractor certification.
- B. Certify manufacturer regularly and presently manufactures aluminum entrances and storefronts as one of their principal products.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Deliver aluminum entrance and storefront material to the site in packages or containers; labeled for identification with the manufacturer's name, brand and contents.
- B. Store aluminum entrance and storefront material in weather-tight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation.

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):
 1. B209-07 Aluminum and Aluminum-Alloy Sheet and Plate
 2. B221-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 3. E283-04 Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 4. E331-00(R2009) Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
 5. F468-10 Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
 6. F593-02(R2008) Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. National Association of Architectural Metal Manufacturers (NAAMM):
 1. AMP 500 Series Metal Finishes Manual
- D. American Architectural Manufacturer's Association (AAMA):
 1. 2604-10 High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels

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E. American Welding Society (AWS):

1. D1.2-08 Structural Welding Code Aluminum

1.7 PERFORMANCE REQUIREMENTS:

- A. Shapes and thickness of framing members shall be sufficient to withstand the design wind loads as calculated per the 2012 IBC for the site conditions.
- B. Air Infiltration: When tested in accordance with ASTM E 283, air infiltration shall not exceed 2.63×10^{-5} cm per square meter (0.06 cubic feet per minute per square foot) of fixed area at a test pressure of 0.30 kPa (6.24 pounds per square foot) 80 kilometers (50 mile) per hour wind.
- C. Water Penetration: When tested in accordance with ASTM E 331, there shall be no water penetration at a pressure of 0.38 kPa (8 pounds per square foot) of fixed area.

PART 2 - PRODUCTS**2.1 MATERIALS:**

- A. Aluminum, ASTM B209 and B221:
 1. Alloy 6063 temper T5 for doors, door frames, fixed glass sidelights storefronts.
 2. Alloy 6061 temper T6 for guide tracks for sliding doors and other extruded structural members.
 3. For color anodized finish, use aluminum alloy as required to produce specified color.
- B. Fasteners:
 1. Aluminum: ASTM F468, Alloy 2024.
 2. Stainless Steel: ASTM F593, Alloy Groups 1, 2 and 3.

2.2 FABRICATION:

- A. Fabricate doors, of extruded aluminum sections not less than 3 mm (0.125 inch) thick. Fabricate glazing beads of aluminum not less than 1.0 mm (0.050 inch) thick.
- B. Accurately form metal parts and accurately fit and rigidly assemble joints, except those joints designed to accommodate movement. Seal joints to prevent leakage of both air and water.
- C. Make welds in aluminum in accordance with the recommended practice AWA D1.2. Use electrodes and methods recommended by the manufacturers of the metals and alloys being welded. Make welds behind finished surfaces so as to cause no distortion or discoloration of the exposed side. Clean welded joints of welding flux and dress exposed and contact surfaces.
- D. Make provisions in doors and frames to receive the specified hardware and

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accessories. Coordinate schedule and template for hardware specified under Section 08 71 00, DOOR HARDWARE. Where concealed closers or other mechanisms are required, provide the necessary space, cutouts, and reinforcement for secure fastening.

- E. Fit and assemble the work at the manufacturer's plant. Mark work that cannot be permanently plant-assembled to assure proper assembly in the field.

2.3 PROTECTION OF ALUMINUM:

- A. Isolate aluminum from contact with dissimilar metals other than stainless steel, white bronze, or zinc by any of the following:
 - 1. Coat the dissimilar metal with two coats of heavy-bodied alkali resistant bituminous paint.
 - 2. Place caulking compound, or non-absorptive tape, or gasket between the aluminum and the dissimilar metal.
 - 3. Paint aluminum in contact with mortar, concrete and plaster, with a coat of aluminum paint primer.

2.4 FRAMES:

- A. Fabricate doors, frames, mullions, transoms, frames for fixed glass and similar members from extruded aluminum not less than 3 mm (0.125 inch) thick.
- B. Provide integral stops and glass rebates and applied snap-on type trim.
- C. Use concealed screws, bolts and other fasteners. Secure cover boxes to frames in back of all lock strike cutouts.
- D. Fabricate framework with thermal breaks in frames where insulating glass is scheduled and specified under Section 08 80 00, GLAZING.

2.5 STILE AND RAIL DOORS:

- A. Nominal 45 mm (1-3/4 inch) thick, with stile and head rail 125 mm (5 inches) wide, and bottom rail 250 mm (10 inches) wide.
- B. Bevel single-acting doors 3 mm (1/8 inch) at lock, hinge and meeting stile edges. Provide clearances of 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. Form glass rebates integrally with stiles and rails. Glazing beads may be formed integrally with stiles and rails or applied type secured with fasteners at 150 mm (6 inches) on centers.
- C. Construct doors with a system of welded joints or interlocking dovetail joints between stiles and rails. Clamp door together through top and bottom rails with 9 mm (3/8 inch) primed steel rod extending into the stiles, and having a self-locking nut and washer at each end. Reinforce stiles and rails to prevent door distortion when tie rods are tightened. Provide a compensating spring-type washer under each nut to take up any stresses that may develop. Construct joints between rails and stiles to remain rigid and tight when door is operated.

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- D. Weather-stripping: Provide removable, neoprene or vinyl weather-stripping attached to aluminum or vinyl holder. Make slots for applying weather-stripping integral with doors and door frame stops. Apply continuous weather-stripping to heads, jambs, bottom, and meeting stiles of doors and frames. Install weather-stripping so doors can swing freely and close positively.
- E. Provide neoprene or vinyl weather stripping for acoustic performance of interior doors.

2.6 REINFORCEMENT FOR BUILDERS HARDWARE:

- A. Fabricate from stainless steel plates.
- B. Hinge and pivot reinforcing: 4.55 mm (0.1793 inch) thick.
- C. Reinforcing for lock face, flush bolts, concealed holders, concealed or surface mounted closers: 2.66 mm (0.1046 inch) thick.
- D. Reinforcing for all other surface mounted hardware: 1.5 mm (0.0598 inch) thick.

2.7 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Fluorocarbon Finish: AAMA 605.2, high performance coating.

PART 3 - EXECUTION**3.1 INSTALLATION:**

- A. Allowable Installation Tolerances: Install work plumb and true, in alignment and in relation to lines and grades shown. Variation of 3 mm (1/8 inch) in 2400 mm (8 feet), non-accumulative, is maximum permissible for plumb, level, warp, bow and alignment.
- B. Anchor aluminum frames to adjoining construction at heads, jambs and bottom and to steel supports, and bracing. Anchor frames with stainless steel or aluminum countersunk flathead, expansion bolts or machine screws, as applicable. Use aluminum clips for internal connections of adjoining frame sections.
- C. Where work is installed within masonry or concrete openings, place no parts other than built-in anchors and provision for operating devices located in the floor, until after the masonry or concrete work is completed.
- D. Install hardware specified under Section 08 71 00, DOOR HARDWARE.
- E. Install hung door operators specified under Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS.

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3.2 ADJUSTING:

- A. After installation of entrance and storefront work is completed, adjust and lubricate operating mechanisms to insure proper performance.

3.3 PROTECTION, CLEANING AND REPAIRING:

- A. Remove all mastic smears and other unsightly marks, and repair any damaged or disfiguration of the work. Protect the installed work against damage or abuse.

3.4 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 08 42 43**ICU/CCU SMOKE RATED SLIDING STOREFRONTS****PART I - GENERAL****1.01 SUMMARY**

- A. WORK INCLUDED: Furnish complete intensive care aluminum door system, as specified, that has been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.
- B. RELATED WORK:
 - 1. Concrete: Division 03, applicable sections.
 - 2. Masonry: Division 04, applicable sections.
 - 3. Thermal and Moisture Protection: Division 07, applicable sections.
 - 4. Openings: Division 08, applicable sections.
 - 5. Electrical, applicable sections.
 - 6. Fire Alarm, applicable sections.

1.02 REFERENCES

- A. AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION (AAMA) 101: Dissimilar Materials.
- B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI): ANSI Z97.1: Safety Glazing Materials Used in Buildings - Methods of Test.
- C. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) B221: Aluminum-Alloy Extruded Bars, Rods, Shapes and Tubes.
- D. NATIONAL FIRE PROTECTION ASSOCIATION:
 - 1. NFPA 101: Code for Safety to Life from Fire in Buildings & Structures.
 - 2. NFPA 105: Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives.
- E. THE ALUMINUM ASSOCIATION (AA) Aluminum Finishes Manual.
- F. OMEGA POINT LABORATORIES: Authorized Testing Laboratory for Smoke Containment Barrier Doors.
- G. UNDERWRITERS LABORATORIES (UL): 1784 Air Leakage Test of Door Assemblies

1.03 SUBMITTALS

- A. PRODUCT DATA: Submit manufacturer's complete product and installation data.
- B. SHOP DRAWINGS: Submit drawings showing layout, profiles, product components including anchorage, accessories, finish and glazing details (where required).

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- C. QUALITY ASSURANCE AND CLOSEOUT SUBMITTALS: Submit the following:
1. Manufacturer's Operation and Maintenance Data.
 2. Warranty document as specified herein.

1.04 QUALITY ASSURANCE

- A. INSTALLERS QUALIFICATIONS: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to product manufacturer.
- B. MANUFACTURER'S QUALIFICATIONS: Manufacturer to have minimum (5) five years successful experience in the fabrication of intensive care doors of the type required for this project. Manufacturer capable of providing field service representation during installation, approving acceptable installer and approving application method.

1.05 WARRANTIES

- A. MANUFACTURER'S WARRANTY: Units to be warranted against defect in material and workmanship for a period of one year from the Date of Substantial Completion. Manufacturer's warranty is in addition to, and not a limitation of, other rights owner may have under Contract Documents.
- B. DISTRIBUTOR'S WARRANTY: 1 year warranty: Labor & transportation charges for defective parts replacement.

1.06 PROJECT CONDITIONS

FIELD MEASUREMENTS: Verify actual dimensions/openings by field measurements before fabrication and record on shop drawings. Coordinate with fabrication and construction schedule to avoid construction delays.

1.07 DELIVERY, STORAGE AND HANDLING

- A. ORDERING AND DELIVERY: Comply with factory's ordering instructions and lead time requirements. Delivery shall be in factory's original, unopened, undamaged containers with identification labels intact.
- B. STORAGE AND PROTECTION: Provide protection from exposure to harmful weather conditions and vandalism.

PART II - PRODUCTS**2.01 MANUFACTURER**

- A. Product shall be equivalent to Besam VersaMax Telescopic ICU/CCU entrances (Basis of Design):
- B. Acceptable manufacturers include ASSA ABLOY Entrance Systems, Horton Automatics, Stanley Access Technologies.
1. Bi-Parting, full breakout entrances.
 2. Breakout of sliding panels and sidelites.
 3. Smoke rated entrances certified to UL 1784.
 4. Configuration shall be as shown on the drawings. Manufacturer

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shall regularly manufacture intensive care sliding door(s) of type(s) and size(s) specified on plans and door schedule.

2.02 EQUIPMENT

- A. MANUFACTURED DOOR UNITS: Shall include header with track, jambs, sliding door panel(s), and sidelite(s). Units to be mounted within rough opening with sliding panel sliding along sidelite. Units will be single-slide and will be one of the following unit types:
1. Type 310: Slide-swing panel shall slide along interior side. Swing-out sidelite.
 2. Type 310 Trackless: Slide-Swing panel(s) shall slide along interior side. Swing-out sidelite (door must be in full open position). No floor track or recess required.
- B. AIR INFILTRATION RATING: Units tested and certified by Omega Point to be in compliance with UL 1784. Maximum leakage rate at ambient temperature shall be less than 1 CFM/ft² of opening at 0.3 in. of water. At 400°F the rate of leakage shall be less than 1 CFM/ft² of opening at 0.3 in. of water.
- C. HEADER: Shall be slim 4" (102mm) deep by 6" (152mm) high aluminum construction with extruded z-profile reinforcement for dead load and lateral strength. Header shall have removable face plate.
- D. SELF-CLOSING MECHANISM: Shall be mechanical requiring no electrical power and shall be fully concealed within header. Coiled spring under tension attached to sliding door shall work with hydraulic damper to provide adjustable 6-8 lbs of closing force. Manual opening force shall not exceed 12 lbs.
1. Standard Hold-Open:
 - a. Shall be engaged when 8-12 lbs. of force is applied to door panel in full open position.
 - b. Shall be disengaged when 6-8 lbs. of force is applied to door panel.
 2. Optional Electro-Magnetic Hold-Open:
 - a. Device shall be tied to building fire alarm system allowing the door to stay open and then automatically close when the fire alarm is triggered without user intervention.
- E. HEADER TRACK: Shall be be aluminum, nylon covered and replaceable. Rollers will be steel, high quality ball bearing wheels 1-1/4" (32 mm) diameter. Anti-Derailing shall be accomplished by means of a continuous aluminum extrusion full length of slide panel travel.
- F. SLIDING PANEL AND SIDELITE: Shall be aluminum, 1-3/4" (44 mm) deep with narrow stile construction. Weather-stripping to be along vertical rails of sliding panel(s) and swing-out sidelite(s). Concealed guides to stabilize bottom of sliding panel. Standard glazing prep to be for 1/4" (6 mm) tempered glass. Wet glazed with red high temperature silicone sealant at corners.
1. Total weight limit per panel shall be:
 - a. 200 lbs. (90.7 kg) for slide panel (non-breakout)
 - b. 156 lbs. (70.7 kg) for UL listed slide-swing panel
 2. Sliding Panel and Sidelite Options shall be:

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- a. Medium and wide stiles.
 - b. Recessed sidelite and track and non-threshold application.
 - c. 6-1/2", and 10" bottom rails.
- G. BREAKOUT FEATURE: Slide-swing panels must swing out 90° from any position of slide movement after positive latching is released) and require no more than 50 lbf. (222 N) of force applied at the strike stile to open. Exception: Type 310 Trackless (after positive latching and flush bolt are released) - door must be in full open position before panels can swing out.
- 1. Breakout mechanism shall provide support across full width of the door, in normal operating mode. In breakout mode, torsion assembly shall support weight of the door to minimize drop.
 - 2. Slide-swing panels shall include intermediate horizontal rail.
 - 3. Units with floor mounted track and breakout feature are UL listed as an exit way and are compliant with NFPA 101.
- H. JAMBS/FRAME: Shall be aluminum, 1 3/4" (44 mm) deep by 4" (102 mm) wide.
- I. HARDWARE: Positive latching shall be provided as follows:
- 1. Type 310: The slide-swing panel shall be provided with positive latch that will latch this panel in place when closed. A lever handle shall be provided on each side of the sliding panel to unlock the door. The swing-out sidelite shall include a positive latch to lock it in place.
 - a. Exception: Trackless units shall include a flush bolt to lock the swing-out sidelite in place.
 - b. Unit shall be able to be locked after pharmacy hours of operation.

2.03 MATERIALS, FINISHES AND FABRICATION

- A. EXTRUDED ALUMINUM: ASTM B221, 6063-T5 alloy and temper, anodized:
- 1. Structural Header Sections: Minimum 3/16" (5 mm) thickness.
 - 2. Structural Frame Sections: Minimum 1/8" (3 mm) thickness.
 - 3. Structural Panel Sections: Commercial grade.
- B. FINISHES (for all exposed aluminum surfaces): Shall be:
- 1. 204-R1 Clear: Arch. Class 2 Clear Anodized Coating, AA-MI2C22A31.
- C. PANEL CONSTRUCTION:
- 1. Corner block type with 3/16" steel backup plate construction, mechanically secured with minimum of four hardened steel screws. Sash consists of snap-in glass stops, snap-in glazing beads and vinyl gaskets. Gasketing material is high temperature silicone and is to be captured in extruded aluminum door panel. Floor Smoke Seal is high temperature brush. All seals to be factory installed to maintain UL 1784 rating.
 - 2. Weatherstripping material captured in extruded aluminum door panel. Door nosing weatherstrip to be spring-loaded adjustable astragal type. Surface applied self-adhesive weatherstripping not acceptable.
 - 3. Slide-swing doors to be supplied with adjustable glass setting block to allow for adjusting of door to meet site conditions eliminating the need for additional shims.

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- D. FRAME CONSTRUCTION: Butt joints, mechanically secured by means of screws & formed aluminum brackets.

PART III - EXECUTION**3.01 EXAMINATION**

SITE VERIFICATION OF CONDITIONS: Installer must verify that base conditions previously installed under other sections are acceptable for product installation according to with manufacturer's instructions. Notify the Contractor in writing of conditions detrimental to the proper and timely completion of work. Do not start work until all negative conditions are corrected in a manner acceptable to the installer and manufacturer.

3.02 INSTALLATION

- A. GENERAL: Install door units plumb, level and true to line, without warp or rack of frames or sash with manufacturer's prescribed tolerances. Provide support and anchor in place.
- B. DISSIMILAR MATERIALS: Comply with AAMA 101, Appendix Dissimilar Materials by separating aluminum materials and other corrodible surfaces from sources of corrosion or electrolytic action contact points.
- C. SMOKE CONTAINMENT BARRIER CONSTRUCTION: Install header and framing members in a bed of neutral cure silicone sealant to maintain compliance with NFPA 105. Coordinate installation with wall flashings and other components of construction.

3.03 CLEANING, ADJUSTMENT AND PROTECTION

- A. CLEANING: After installation, installer to take following steps:
1. Remove temporary coverings and protection of adjacent work areas.
 2. Remove construction debris from construction site and legally dispose of debris.
 3. Repair or replace damaged installed products.
 4. Clean product surfaces and lubricate operating equipment for optimum condition and safety.
- B. ADVISE CONTRACTOR: Of precautions required through the remainder of the construction period, to ensure that doors will be without damage or deterioration (other than normal weathering) at the time of acceptance.

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SECTION 08 56 66

SECURITY WINDOW SCREENS

PART 1 - GENERAL

1.1 DESCRIPTION

Security screens consist of a sub-frame, main frame with wire cloth and support assembly, security lock and bolt, hinges and all fittings and anchors required.

1.2 RELATED WORK

- A. Section 08 51 23, STEEL WINDOWS.
- B. Section 08 41 13, ALUMINUM WINDOWS.
- C. Color of finish paint: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Preparation and finish of frames: Section 09 91 00, PAINTING.

1.3 MANUFACTURERS QUALIFICATIONS

- A. Approval by Resident Engineer is required of products of proposed manufacturer or supplier, and will be based upon submission by Contractor of certification.
- B. Contractor certifies that the manufacturer regularly and presently manufactures detention and protection screens as one of his principal products.
- C. Contractor certifies that the manufacturer's product submitted has been in satisfactory and efficient operation on three installations similar or equivalent to this project for three years. Submit list of installations. List shall include name of project and owner and location of project.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23 SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples: One completely finished security screen as specified. Upon approval, screen may be installed on the job.

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- C. Shop Drawings: Complete details (1/2 full scale), showing details of construction and anchorage, relation to details of the windows and clearances required and window operators.
 - D. Manufacturer's Certificates:
 - 1. Indicating manufacturer's qualification specified.
 - 2. Indicating wire screen cloth meets the requirements specified.
 - E. Manufacturer's Literature and Data

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 Material:
 - A653/A653M-10.....Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

PART 2 - PRODUCTS

2.1 WIRE CLOTH

Stainless steel wire cloth woven from 0.7 mm (0.028-inch) diameter, Type 304 stainless steel wire, woven 12 mesh, double crimped. Tensile strength of mesh to be 15kg/mm

2.2 SHEET STEEL

ASTM A653/A653M

2.3 FABRICATION

- A. Make screens units without muntins and design to be mounted flush with trim, frame or wall face.
- B. Fabricate scribe members from 1.5 mm (0.0598-inch) thick sheet steel and install at head and jambs of openings.
- C. Where lightproof shade occurs, limit swing of screen to 90 degrees.
- D. Frames: Weld corners of fixed and hinged frames continuously. Outside reinforcements or projections will not be permitted. Dress weld smooth so as to be inconspicuous. Round exposed edges and corners.

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- E. Drill and tap fixed frames for adjustment against scribe members. Drill head rail of hinged frames on room side for installation of shade brackets. Locate holes on center line of rail, 38 mm (1-1/2 inches) outside edges of stiles.
 - F. Reinforce frames lighter than 2.5 mm (0.105-inch) thick steel at locks and hinges with steel plates not less than 5 mm (3/16-inch) thick.
 - G. Provide rubber cushion plugs (bumpers) on lock between fixed and hinged frames. Locate bumpers 150 mm (6-inches) from top and bottom on side of frame where lock bolts or slides occur.

2.5 PROTECTION SCREENS

- A. Reinforce hinged frames over four feet in height horizontally or vertically, or both if width exceeds five feet.
- C. Screen Unit - Screen unit consists of a fixed sub-frame of not less than 2.7 mm (0.105-inch) thick "Z" (zee) shaped members and a hinged main frame.
 - 1. Fabricate hinged frames of not less than 2.7 mm (0.105-inch) thick channel shaped members having an extended inner flange. Form flange edge with a right angle return forming a channel to receive wire cloth retaining strip.
 - 2. Screening Attachment: Bend screening to fit over the screen frame and attach using a 1.5 mm (0.060-inch) thick retaining angle, continuous on all four sides. Clamp screening between retaining angle and return edge of hinged frame with hardened steel machine screws spaced approximately 125 mm (5 inches) on center.

2.6 HARDWARE

- A. Operating hardware shall be extra heavy duty type.
- B. Locks for Window Screens: Provide concealed locking system for each screen consisting of one, bit-key operated locking mechanism having a minimum of two operable, concealed 13 mm (1/2-inch) diameter case-hardened steel bolts. Locate bolts near the top and bottom of screen. Design bolts to engage adjustable strike or keepers in the sub-frame when bit key is rotated in lock.
- C. Construct bit key lock of steel construction with three brass tumblers having beryllium copper springs. Fabricate lock case from steel using

two piece construction having three brass pedestal bearing supports attached to the lower half of the case to support the slide bar, tumblers, case and cover. Fabricate slide bar of lock from steel with hardened steel guide tumbler block.

- D. Make provisions to insure that the bit key can not be removed except when the bolts are in a locked (extended) position. Locks shall be keyed alike. Design locks so as to be operated by existing attendant's key established for the VA Medical Center. Furnish bit keys as required by VA. Make keys from forged steel or solid bronze with chromium or cadmium plated finish.

2.7 FINISH

After surface treatment of the frame, apply two coats of baked-on enamel to all surfaces before the wire cloth is installed and secured into the frame.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Drill, tap or cut metal window trim and other materials as required for proper installation of screen units.
- B. Install screen units that can be readily removed without damage to new or existing work and to effectively exclude insects.
- C. Secure screen units to metal window with steel case hardened machine screws, spaced at approximately 375 mm (15 inches) on centers.
- D. Provide screw fastenings of type, size and head as recommended by manufacturer of screen units.
- E. Anchor screen units to wood with stainless steel flathead wood screws at sill and stainless steel round head wood screws at head, mullions and jambs. Toggle bolts may be used if they do not interfere with sash balances or weights at jambs or mullions.

- - - E N D - - -

SECTION 08 71 00**DOOR HARDWARE****PART 1 - GENERAL****1.1 DESCRIPTION**

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, INTERIOR WOOD DOORS; Section 08 11 13, HOLLOW METAL DOORS AND FRAMES; Section 08 17 10, INTEGRATED DOOR ASSEMBLIES; Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS; Section 08 42 43, INTENSIVE CARE UNIT/CRITICAL CARE UNIT (ICU/CCU) ENTRANCES; Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS.
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Card Readers: Section 28 13 11, 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 UFAS, (Uniform Federal Accessible Standards) 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

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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, if possible, 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 52.24-21, except that the Warranty period shall be two years in lieu of one year for all items except as noted below:

1. Locks, latch sets, 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.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES. Submit 6 copies of the schedule per Section 01 33 23 plus 2 copies to the VAMC Locksmith (VISN Locksmith if the VAMC does not have a locksmith).

- B. Hardware Schedule: Prepare and submit hardware schedule in the following form:

Hard-ware Item	Quantity	Size	Reference Publi-cation Type No.	Finish	Mfr. Name and Cata log No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designati on

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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.

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 Contracting Officer's Representative for reference purposes. Tag shall identify items by Project Specification number and manufacturer's catalog number. These items shall remain on file in Contracting Officer's Representative's office until all other similar items have been installed in project, at which time the Contracting Officer's Representative 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, Project Engineer 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.

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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 "HW" followed by a number. Each number designates a set of hardware items applicable to a door type.
- B. Manufacturers' Catalog Number References: Where manufacturers' products are specified herein, products of other manufacturers which are considered equivalent to those specified may be used. Manufacturers whose products are specified are identified by abbreviations as follows:

Adams Rite	Adams Rite/Assa Abloy	Phoenix, AZ
Besam	Besam/Assa Abloy	
Best	Best	Indianapolis, IN
Don-Jo	Don-Jo Manufacturing	Sterling, MA
G.E. Security	GE Security, Inc.	Bradentown, FL
Markar	Markar Architectural Products	Pomona, CA
Pemko	Pemko Manufacturing Co.	Ventura, CA
Rixson	Rixson	Franklin Park, IL
Rockwood	Rockwood Manufacturing Co.	Rockwood, PA
Securitron	Securitron Magnalock Corp.	Sparks, NV
Southern Folger	Southern Folger Detention Equipment Co.	San Antonio, TX
Schlage	Schlage	Colorado Springs, CO
Stanley	The Stanley Works	New Britain, CT
Tice	Tice Industries	Portland, OR
Trimco	Triangle Brass Mfg. Co.	Los Angeles, CA
Zero	Zero Weather Stripping Co.	New York, NY

- C. Keying: All cylinders shall be keyed into existing Grand Master Key System. Coordinate keying with Contracting Officer's Representative. 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 Contracting Officer's Representative.
- D. 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.

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1. Keying information will be furnished to the Contractor by the Contracting Officer's Representative.
2. Supply information regarding key control of cylinder locks to manufacturers of equipment having cylinder type locks. Notify Contracting Officer's Representative immediately when and to whom keys or keying information is supplied. Return all such keys to the Contracting Officer's Representative.

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. American Society for Testing and Materials (ASTM):
 1. F883-04 Padlocks
 2. E2180-07 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):
 1. A156.1-06 Butts and Hinges
 2. A156.2-03 Bored and Pre-assembled Locks and Latches
 3. A156.3-08 Exit Devices, Coordinators, and Auto Flush Bolts
 4. A156.4-08 Door Controls (Closers)
 5. A156.5-01 Auxiliary Locks and Associated Products
 6. A156.6-05 Architectural Door Trim
 7. A156.8-05 Door Controls-Overhead Stops and Holders
 8. A156.12-05 Sliding and Folding Door Hardware
 9. A156.13-05 Mortise Locks and Latches Series 1000
 10. A156.15-06 Release Devices-Closer Holder, Electromagnetic and Electromechanical
 11. A156.16-08 Auxiliary Hardware
 12. A156.17-04 Self-Closing Hinges and Pivots
 13. A156.18-06 Materials and Finishes
 14. A156.20-06 Strap and Tee Hinges, and Hasps
 15. A156.21-09 Thresholds
 16. A156.22-05 Door Gasketing and Edge Seal Systems
 17. A156.23-04 Electromagnetic Locks
 18. A156.24-03 Delayed Egress Locking Systems

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- 19. A156.25-07 Electrified Locking Devices
- 20. A156.26-06 Continuous Hinges
- 21. A156.28-07 Master Keying Systems
- 22. A156.29-07 Exit Locks and Alarms
- 23. A156.30-03 High Security Cylinders
- 24. A156.31-07 Electric Strikes and Frame Mounted Actuators
- 25. A250.8-03 Standard Steel Doors and Frames

- D. National Fire Protection Association (NFPA):
 - 1. 80-10 Fire Doors and Fire Windows
 - 2. 101-09 Life Safety Code

- E. Underwriters Laboratories, Inc. (UL):
 - 1. Building Materials Directory (2008)

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:

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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 lbs.) 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 6.35 mm (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.

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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

- A. Comply with ANSI A156.4. Provide stainless steel floor plates for floor closers and floor pivots, except where metal thresholds occur. Provide cement case for all floor closers. Floor closers specified for fire doors

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shall comply with Underwriters Laboratories, Inc., requirements for concealed type floor closers for classes of fire doors indicated on drawings. Hold-open mechanism, where required, shall engage when door is opened 105 degrees, except when door swing is limited by building construction or equipment, the hold-open feature shall engage when door is opened approximately 90 degrees. The hold-open mechanism shall be selectable on/off by turning a screw through the floor plate. Floor closers shall have adjustable hydraulic back-check, adjustable close speed, and adjustable latch speed. Provide closers with delayed action where a hold-open mechanism is not required. Floor closers shall be multi-sized. Single acting floor closers shall also have built in dead stop. Where required, provide closers with special cement cases appropriate for shallow deck installation or where concrete joint lines run through the floor blockout. At offset-hung doors installed in deep reveals, provide special closer arm and spindle to allow for installation. Where stone or terrazzo is applied over the floor closer case, provide closer without floor plate and with extended spindle (length as required) and special cover pan (depth as required) to allow closer to be accessed without damaging the material applied over the closer. Pivots for non-labeled doors shall be cast, forged or extruded brass or bronze.

- B. Where floor closer appears in hardware set provide the following as applicable.
1. Double Acting Floor Closers: Type C06012.
 2. Single Acting Floor Closer: Type C06021 (center pivoted). (Intermediate pivot is not required).
 3. Single Acting Floor Closers: Type C06041 (offset pivoted).
 4. Single Acting Floor Closer for Labeled Fire Doors: Type C06051 (offset pivoted).
 5. Single Acting Floor Closers For Lead Lined Doors: Type C06071 (offset pivoted).

2.6 COMBINATION CLOSER - HOLDER - Not Used**2.7 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 lead 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

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- 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).

2.8 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.

2.9 LOCKS AND LATCHES

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

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with 19 mm (3/4 inch) throw, unless shorter throw allowed by 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.

- A. 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 existing hospital standard levers. No substitute lever design or 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 A156.5.
 3. Permanent cores will be reused by Pharmacy. Coordinate with COR prior to taking over space to allow existing permanent cores to be removed and secured by Pharmacy Chief/staff and install construction cores for duration of project. Contractor to make necessary adjustments to allow re-use of existing cores in new hardware, up to and including use of all new cores. New hardware will be installed with construction cores. At no point shall permanent cores be allowed to be accessed by any other personnel other than authorized Pharmacy staff. Construction cores will be installed during contract and two sets of keys provided to COR, with existing cores being coordinated to transfer to campus locksmith.

2.10 PUSH-BUTTON COMBINATION LOCKS

- A. ANSI/BHMA A156.13, Grade 1. Battery operated push-button 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 UFAS 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.

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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 lbf (6672 N)
 3. Inductive Kickback Peak Voltage: Not more than 53 V.
 4. Residual Magnetism: Not more than 4 lbf (18 N) to separate door from magnet.

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; only if existing cores cannot be reused:

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

- A. Pharmacy will re-use existing 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-mop plates and armor plates plastic or metal, Type J100 series, color as required. When wood grain plastic plates are indicated in Finish Legend on Drawings, wood grain of plates shall run perpendicular to direction of grain of face veneer of wood doors.
 2. Provide kick-mop plates for both sides of each new door, except AS noted in Door Schedule. Kick-mop plates shall be 200 mm (8

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inches) high. On push side of doors where jamb stop extends to floor, make combination kick-mop plates 38 mm (1-1/2 inches) less than width of door, except pairs of doors which shall have plates 25 mm (1 inch) less than width of each door. Extend all other combination kick-mop plates to within 6 mm (1/4 inch) of each edge of doors. Kick mop plates shall butt astragals. For jamb stop requirements, see specification sections pertaining to door frames.

3. Armor plates for doors are listed in Door Schedule. Armor plates shall be 875 mm (35 inches) high and 38 mm (1-1/2 inches) less than width of doors, except on pairs of metal doors. 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 rail. On doors equipped with panic devices, extend armor plates to within 13 mm (1/2 inch) of panic bolt cross bar.
4. Where louver or grille occurs in lower portion of doors, substitute stretcher plate and kick-mop plate in place of armor plate. Size of stretcher plate and kick-mop plate shall be 200 mm (8 inches) high.
5. Kick plates and armor plates over 450 mm (18 inches) high on fire rated doors must be labeled as required by fire rating.

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.

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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 A156.16. 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 DOOR PULLS

- A. Conform to ANSI A156.6. Pull plate 90 mm by 350 mm (3-1/2 inches by 14 inches), unless otherwise specified. Cut plates of door pulls for cylinders, or turn pieces where required.

2.20 PUSH PLATES

- A. Conform to ANSI A156.6. Metal, Type J302, 200 mm (8 inches) wide by 350 mm (14 inches) high. Provide metal Type J300 plates 100 mm (4 inches) wide by 350 mm (14 inches) high where push plates are specified for doors with stiles less than 200 mm (8 inches) wide. Cut plates for cylinders, and turn pieces where required.

2.21 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

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No. 12 wood screws. Cut plates for turn pieces, and cylinders where required. Pull shall be mounted down.

2.22 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.

2.23 THRESHOLDS

- A. Conform to ANSI A156.21, mill finish extruded aluminum, except as otherwise specified. In existing construction, thresholds shall be installed in a bed of sealant with 20 stainless steel machine screws and expansion shields. In new construction, embed aluminum anchors coated with epoxy in concrete to secure thresholds. Furnish thresholds for the full width of the openings.
- B. For thresholds at elevators entrances see other sections of specifications.
- C. At exterior doors and any interior doors exposed to moisture, provide threshold with non-slip abrasive finish.
- D. Provide with miter returns where threshold extends more than 12 mm (0.5 inch) from frame face.

2.24 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).

2.25 WEATHERSTRIPS (FOR EXTERIOR DOORS)

- A. Conform to ANSI A156.22. Air leakage shall not to exceed 0.50 CFM per foot of crack length (0.000774m³/s/m).

2.26 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,

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equip each single or double metal access door with Lock Type E76213, conforming to ANSI A156.5. Key locks as directed. Ship lock prepaid to the door manufacturer. Hinges shall be provided by door manufacturer.

- B. Cylinders for Various Partitions and Doors: Key cylinders same as entrance doors of area in which partitions and door occur[, **except as otherwise specified**]. Provide cylinders to operate locking devices where specified for following partitions and doors:
1. Folding doors and partitions.
 2. Wicket door (in roll-up door assemblies).
 3. Slide-up doors.
 4. Swing-up doors.
 5. Fire-rated access doors-Engineer's key set.
 6. Doors from corridor to electromagnetic shielded room.
 7. Day gate on vault door.
- C. 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.

2.27 PADLOCKS FOR VARIOUS DOORS, GATES AND HATCHES

- A. ASTM E883, size 50 mm (2 inch) wide chain; furnish extended shackles as required by job conditions. Provide padlocks, with key cylinders, for each door in following areas as noted.
- B. Key padlocks as follows:
1. Constant Temperature[**and Cold**] Rooms in Research Departments: Research Laboratory Set.
 2. Cold Room in Morgue Department: Autopsy Set.
 3. Refrigerators in Canteen Department: Canteen Storage Set.
 4. All Refrigerator Rooms in Main Kitchen Department: Kitchen Storage Set.
 5. Chain Link Fence Gates for Electrical Substation and other Fenced Buildings or Areas: Engineer's set, except as otherwise specified.
 6. Chain Link Fence Gates for Oxygen Storage Buildings: Maintenance supply set.
 7. Roof Access and Scuttles: Engineer's set.
 8. Hinged Wicket in Post Office Partitions: Post Office set.
- C. Omit padlocks on communicating refrigerator doors.

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2.28 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS - Not Used**2.29 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. 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.
- E. 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.

2.30 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

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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 Contracting Officer's Representative for approval.
- B. For new buildings locate hardware on doors at heights specified below, with all hand-operated hardware centered within 864 mm (34 inches) to 1200 mm (48 inches), unless otherwise noted:
- C. 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. Where closers are mounted on doors they shall be mounted with sex nuts and bolts; foot shall be fastened to frame with machine screws.
- 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	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

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doors)		
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- 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 Contracting Officer's Representative. 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:

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 Contracting Officer's Representative 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 Contracting Officer's Representative 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 Resident/Project Engineer 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.

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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 Resident/Project Engineer and VA Locksmith.

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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.

ELECTRIC HARDWARE ABBREVIATIONS LEGEND:	
ADO	= Automatic Door Operator
EMCH	= Electro-Mechanical Closer-Holder
MHO	= Magnetic Hold-Open (wall- or floor-mounted)
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

HW-1

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED
	X HOSPITAL TIPS @ INSWING DOORS
1 Office Lock	F04 (Key from outside, inside always free)
1 Kick Plate	J102 (6" x 34" Satin Nickel)
1 Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
1 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1 Floor Stop	BHMA L02121 x 3 FASTENERS (Heavy Duty) (Trimco 1214, or equal)
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)

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HW-2

<u>Each Door to Have:</u>	<u>NON-RATED</u>
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Storeroom Lock	F07 (always locked at exterior side)
1 Electric Strike	FAIL-SECURE, 24VDC.
1 Power Supply	Regulated, Filtered, 24VDC, Amperage as required
1 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
1 Kick Plate	J102 (6" x 34" Satin Nickel)
1 Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1 Floor Stop	BHMA L02121 x 3 FASTENERS (Heavy Duty) (Trimco 1214, or equal)
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)
1 Card Reader w/Keypad	(Pharmacy Exterior side to release Electric Strike and Shunt Alarm for ingress)
1 Request to Exit	Wall Mounted
1 Alarm Horn	
1 Door Position Switch	Connect to Security
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.	
CARD READER BY DIVISION 28.	

HW-3

<u>Each Door to Have:</u>	<u>NON-RATED</u>
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Storeroom Lock	F07 (always locked at exterior side)
1 Electric Strike	FAIL-SECURE, 24VDC.
1 Power Supply	Regulated, Filtered, 24VDC, Amperage as required

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1 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
1 Kick Plate	J102 (6" x 34" Satin Nickel)
1 Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1 Floor Stop	BHMA L02121 x 3 FASTENERS (Heavy Duty) (Trimco 1214, or equal)
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)
1 Card Reader w/Keypad	(Conference Room Exterior side to release Electric Strike for ingress, no alarm)

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

HW-4Each Door to Have:NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Keyed Privacy Indicator Lock	F02 (PRIVACY) x OCCUPANCY INDICATOR with staff over-ride key.
1 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
1 Kick Plate	J102 (6" x 34" Satin Nickel)
1 Mop Plate (@ Inswing side)	J102 (6" x 34" Satin Nickel)
1 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1 Floor Stop	BHMA L02121 x 3 FASTENERS (Heavy Duty) (Trimco 1214, or equal)
1 Set Self-Adhesive Seals	BHMA R0E154
2 Coat Hooks	L03121

Stone Threshold by Others

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HW-5Each Door to Have: NON-RATED

NOT USED

HW-6Each Door to Have: RATED

NOT USED

HW-7Each Door to Have: NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Storeroom Lock	F07
1 Electric Strike	FAIL-SECURE, 24VDC.
1 Power Supply	Regulated, Filtered, 24VDC, Amperage as required
1 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
1 Kick Plate	J102 (6" x 34" Satin Nickel)
1 Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1 Floor Stop	BHMA L02121 x 3 FASTENERS (Heavy Duty) (Trimco 1214, or equal)
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)
1 Card Reader w/Keypad	Releases Strike & Shunts Alarm
1 Intercom	
1 Doorbell	to Reception or Vestibule Desk
1 Door Release Button	from Reception or Vestibule Desk, releases strike and shunts alarm
1 Power Supply	

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- 1 Request to Exit Wall Mounted, shunts alarm
- 1 Alarm Horn
- 1 Door Position Switch Connect to Security
- 120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.
- CARD READER BY DIVISION 28.

HW-8Trackless Horizontal sliding Security Grille:NON-RATED

- 1 Set Hardware TYPE REQUIRED FOR DOOR MATERIAL,
WEIGHT, AND MOUNTING DETAILS
(COMPLETE WITH CEILING TRACK, TRACK
BRACKETS, HANGERS, GUIDES, BUMPERS,
AND INTERNAL TRACK STOPS)
- 2 Pulls By Door Manufacturer
- 1 Lockset Manufacturer's Standard cylinder at corridor side,
thumbturn at waiting room side. Locking
/Latching shall be mounted at accessible height.

TEMPORARY DOORS (As required)

HW-TEMP 1

Each Door to Have:RATED

- | | |
|----------------------|---|
| Hinges | QUANTITY & TYPE AS REQUIRED
X HOSPITAL TIPS @ INSWING DOORS |
| 1 Storeroom Lock | F07 |
| 1 Cylinder | Type as Required |
| 1 Closer | C02011/C02021 (PT4D, PT4F, PT4H) |
| 1 Kick Plate | J102 (6" x 34" Satin Nickel) |
| 1 Wall Stop | BHMA L02251 (Anti-Vandal Rubber
(Trimco 1270CV, or Equal) or L52101 CONVEX |
| 3 Silencers | BHMA L03011 (Trimco 1229A, or Equal) |
| 1 Set Door Gasketing | BHMA R0G154 (Smoke Seal, Pemko S88, or Eq) |

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- - - E N D - - -

SECTION 08 80 00**GLAZING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies glass, plastic, related glazing materials and accessories. Includes glazing with images and patterns. Glazing products specified apply to factory or field glazed items.

1.2 RELATED WORK

- A. Factory glazed by manufacturer in following units:
1. Glazing types: Section 09 06 00, SCHEDULE FOR FINISHES.
 2. Ballistic rated glazing : Section 13 10 10 , BULLET RESISTANT PARTITIONS AND EQUIPMENT
 3. Doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
 4. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
 5. Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
 6. Section 09 06 00, SCHEDULE FOR FINISHES.

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 (National Fenestration Rating Council) label requirements.
 3. Temporary labels shall remain intact until glass is approved by Contracting Officer's Representative.
- B. Permanent labels:
1. Locate in corner for each pane.
 2. Label in accordance with ANSI Z97.1 and SGCC (Safety Glass Certification Council) label requirements.
 - a. Tempered glass.
 - b. Laminated glass or have certificate for panes without permanent label.

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1.4 PERFORMANCE REQUIREMENTS**A. Glass Thickness:**

1. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
2. Test in accordance with ASTM E 330.
3. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.

1.5 SUBMITTALS**A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.****B. Manufacturer's Certificates:**

1. Certificates stating that wire glass, meets requirements for safety glazing material as specified in ANSI Z97.1.
2. Certificate on shading coefficient.
3. Certificate on "R" value when value is specified.
4. Certificate test reports confirming compliance's with specified bullet resistive rating.
5. Certificate that blast resistant glass meets the requirements of UFC4-010-01.

C. Warranty:

1. Submit written guaranty, conforming to General Condition requirements, and to "Warranty of Construction" Article in this Section.

D. Manufacturer's Literature and Data:

1. Glass, each kind required.
2. Insulating glass units.
3. Elastic compound for metal sash glazing.
4. Glazing cushion.
5. Sealing compound.

E. Samples:

1. Size: 150 mm by 150 mm (6 inches by 6 inches).

F. 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.

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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. Storage of materials will be within site limits unless otherwise specified. If Contractor envisions an alternate location, please submit plan, size, and/or location and anticipation of contents/materials to be stored as well as duration to COR 14 work days in advance.
- 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 glazing units against face and edge damage during entire sequence of fabrication, handling, and delivery to installation location.
 - 1. 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.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Field measure openings before ordering tempered glass products. Be responsible for proper fit of field measured products.

1.8 WARRANTY

- A. Warranty: Conform to terms of "Warranty of Construction", FAR clause 52.246-21, except extend warranty period for the following:
 - 1. Insulating glass units to remain sealed for 10 years.
 - 2. Laminated glass units to remain laminated for 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 National Standards Institute (ANSI):
 - 1. Safety Glazing Material Used in Building - Safety Performance Specifications and Methods of Test.
- C. American Society for Testing and Materials (ASTM):
 - 1. C1363-05 Thermal Performance of Building Assemblies, by Means of A Hot Box Apparatus

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2. C542-05 Lock-Strip Gaskets.
 3. C716-06 Installing Lock-Strip Gaskets and Infill Glazing Materials.
 4. C864-05 Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
 5. C920-05 Elastomeric Joint Sealants.
 6. C1036-06 Flat Glass.
 7. C1048-04 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.
 8. C1172-03 Laminated Architectural Flat Glass.
 9. C1349-04 Architectural Flat Glass Clad Polycarbonate.
 10. D635-06 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastic in a Horizontal Position.
 11. E84-08 Surface Burning Characteristics of Building Materials.
 12. E330-02 Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
 13. E774-97 Sealed Insulating Glass Units
- D. Code of Federal Regulations (CFR):
1. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; 1977, with 1984 Revision.
- E. National Fire Protection Association (NFPA):
1. 80-08 Fire Doors and Windows.
- F. National Fenestration Rating Council (NFRC):
1. Certified Products Directory (Latest Edition).
- G. Safety Glazing Certification Council (SGCC):
1. Certified Products Directory (Issued Semi-Annually).
- H. Unified Facilities Criteria (UFC):
1. 4-010-01-2007 DOD Minimum Antiterrorism Standards for Buildings

PART 2 - PRODUCTS**2.1 GLASS**

- A. Use thickness stated unless specified otherwise in assemblies.
- B. Clear Glass:
1. ASTM C1036, Type I, Class 1, Quality q3.

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2. Thickness, as indicated.

C. Patterned Glass:

1. Fabricated from clear glass, pattern as indicated in section 09 06 00
2. Thickness, as indicated.
3. Low Iron.

2.2 HEAT-TREATED GLASS

A. Clear Heat Strengthened Glass:

1. ASTM C1048, Kind HS, Condition A, Type I, Class 1, Quality q3.
2. Thickness, as indicated.

B. Clear Tempered Glass:

1. ASTM C1048, Kind FT, Condition A, Type I, Class 1, Quality q3.
2. Thickness, 6 mm (1/4 inch).

2.3 COATED GLASS

A. Low-E Glass:

1. Low emissivity pyrolytic coating having an E of 0.15.
2. Apply coating to surface of insulating glass units as indicated.

2.4 LAMINATED GLASS

- A. Interlayer between glass panes: ASTM C 1172. Use heat and light stable polyvinyl butyral plasticized resin sheeting. Thickness as indicated.
- B. As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.5 FIRE RESISTANT GLASS WITHOUT WIRE MESH

- A. Fire resistant glass or glass assembly classified by UL in Building Materials Directory or other approved testing laboratory bearing permanent mark of classification.
- B. 20-minute Fire Fire-Resistive-Glazing: Fire-resistive tempered glass; impact safety protection.
1. Impact Safety Rating: Complies with CPSC Cat. I & II.
 2. Visual appearance: Clear.

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2.6 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 shall have a finish that will not corrode or stain while in service.
- B. Setting Blocks: ASTM C864:
 - 1. Channel shape; having 6 mm (1/4 inch) internal depth.
 - 2. Shore a hardness of 80 to 90 Durometer.
 - 3. Block lengths: 50 mm (2 inches) except 100 to 150 mm (4 to 6 inches) for insulating glass.
 - 4. Block width: Approximately 1.6 mm (1/16 inch) less than the full width of the rabbet.
 - 5. 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: One to 25 to 76 mm (1 to 3 inches).
 - 4. Shore a hardness of 40 to 50 Durometer.
- D. Sealing Tapes:
 - 1. Semi-solid polymeric based 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.
- 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 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.
- H. Lock-Strip Glazing Gaskets: ASTM C542, shape, size, and mounting as indicated.
- I. Glazing Sealants: ASTM C920, silicone neutral cure:

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1. Type S.
 2. Class 25
 3. Grade NS.
 4. Shore A hardness of 25 to 30 Durometer.
- J. Structural Sealant: ASTM C920, silicone acetoxo cure:
1. Type S.
 2. Class 25.
 3. Grade NS.
 4. Shore a hardness of 25 to 30 Durometer.
- 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 shall 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 shall 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's approved shop drawings.
- B. Advise Contractor of 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.

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- C. Verify that wash down of adjacent masonry is completed prior to erection of glass and glazing units to prevent damage to glass and glazing units by cleaning materials.

3.2 PREPARATION

- A. For sealant glazing, prepare glazing surfaces in accordance with GANA-02 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-01 Glazing Manual and GANA-02 Sealant Manual 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. Patterned Glass:
 - 1. Install units with one patterned surface with smooth surface on the weather side.
 - 2. Install units in interior partitions with pattern in same direction in all openings.
- G. Tempered Glass: Install with roller distortions in horizontal position unless otherwise directed.
- H. Laminated Glass:
 - 1. Tape edges to seal interlayer and protect from glazing sealants.
 - 2. Do not use putty or glazing compounds.

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I. Fire Resistant Glass:

1. Fire resistant glass: Glaze in accordance with UL design requirements.

3.4 INSTALLATION - DRY METHOD (TAPE AND GASKET SPLINE GLAZING)

- A. Cut glazing spline to length; install on glazing pane. Seal corners by butting and sealing junctions with butyl sealant.
- 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 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.

3.5 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 1/3 points with edge block no more than 150 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.
- 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.

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3.6 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.
- F. Trim protruding tape edge.

3.7 REPLACEMENT AND CLEANING

- A. Clean new glass surfaces removing temporary labels, paint spots, and defacement after approval by Contracting Officer's Representative.
- 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.

3.8 PROTECTION

- A. Protect finished surfaces from damage during erection, and after completion of work. Strippable plastic coatings on colored anodized finish are not acceptable.

3.9 GLAZING SCHEDULE

- A. Refer to Drawings and specification Section 09 06 00, SCHEDULE FOR FINISHES

- - - E N D - - -

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09 06 00
SCHEDULE FOR FINISHES**PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section contains a coordinated color system in which requirements for materials specified in other sections of this specification and/or shown on the drawings are identified by color codes and/or paint finishes.
- B. This section is intended for the purpose of identifying finishes and colors only. Refer to individual technical specification sections for material and product properties and requirements and for installation requirements.

1.2 MANUFACTURERS

- A. Manufacturer's (mfr.) trade names and numbers used herein identify colors, finishes, textures, and patterns. Subject to the approval of the contracting officer, products of other manufacturers will be considered, provided they are equivalent to the colors, finishes, textures and patterns of the manufacturers listed, and meet the requirements of the technical specifications and drawings.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS. Furnish quadruplicate samples for color approval of all materials, colors, and textures specified in this section.

INDEX AND SPECIFICATION REFERENCE

	<u>Specification Section</u>
PAINT	
2.1.A. Painting	09 91 00
FLOORING	
2.2.A. Porcelain Floor Tile	09 30 13
2.2.B. Luxury Vinyl Tile	09 65 19
2.2.C. Resilient Rubber Sheet Flooring (Heat Welded Seams) with Integral Coved Base	09 65 16
2.2.D. Carpeting	09 68 00
INTERIOR WALLS	
2.3.A. Steel Frames	08 11 13
2.3.B. Wood Doors	08 14 00
2.3.C. Kick, Mop and Armor Plates	08 71 00
2.3.D. Special Doors	
1. Access Doors	08 31 13
2.3.E. Ceramic Mosaic Wall Tile	09 30 13

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2.3.F.	Resilient Base	09 65 13
2.3.G.	Solid Polymer Wall Panels	09 77 60
2.3.H.	FRP Decorative Wall Panel (Alternate #6)	
	06 20 00	
2.3.I.	Wall Panel System	09 77 00
2.3.J.	Interior Reveals	09 29 00
2.3.K.	Decorative Formed Metal	05 75 00
2.3.L.	Wall Guard	10 26 00
2.3.N.	Interior Glazing	08 80 00

CEILING

2.4.A.	Acoustical Treatment	09 51 00, 09 54 26
2.4.B.	Suspension System	09 51 00

ARCHITECTURAL WOODWORK

2.5.A.	Plastic Laminate	06 20 00
2.5.B.	Solid Polymer Countertops	06 20 00
2.5.C.	Quartz Surface Material	12 36 61
2.5.D.	Resin Panel	09 76 00
2.5.E.	Casework Hardware	06 20 00

MISCELLANEOUS - INTERIOR

2.6.A.	Architecturally Exposed Aluminum	06 20 00
2.6.B.	Miscellaneous Wood and Metal Requiring Paint	09 91 00
2.6.C.	Aluminum Corner and Edge Guards	09 29 00
2.6.D.	Window Shades	12 24 00

EXTERIOR WALLS & ACCESSORIES

2.8.A.	Glazing	08 80 00
2.8.B.	Exterior Composite Metal Panels	07 42 43

PART 2 - PRODUCTS

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2.1 PAINT (P)

A. Painting:

	<u>MANUFACTURER</u>	<u>COLOR NUMBER</u>
P-1	Kelly Moore	23 Swiss Coffee (Field Wall)
P-2	Kelly Moore	OW241-1 Almond Sugar (Ceiling)
P-3	PPG/Matthews	Color: to match P-1 (Steel Frames)

B. Texture:

1. LL: Low-Luster
2. SG: Semi-Gloss
3. EGS: Eggshell
4. HG: High-Gloss

2.2 FLOORING

A. Porcelain Floor Tile (PT-1):

1. Tile Size: 12 by 24 inches, cushion edge, straight joints.
2. Refer to Interior Finish Schedule for locations

	<u>MANUFACTURER</u>	<u>COLOR</u>
PT-1:	TBD	AV224 Timber (12'' x 24'')

3. Grout: Epoxy Grout at all locations.

<u>MANUFACTURER</u>	<u>COLOR</u>
Custom Building Products	To match PT-1

B. Luxury Vinyl Flooring - Luxury Vinyl Tile flooring with glue down installation(LVT):

1. Flooring:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
LVT-1:	Tandus Centiva	Modern Stone	12x12 Capri
LVT-2:	Tandus	Rays	Plank,Ore FE-0795-C
LVT-3	Tandus Centiva	WP OL07-C-TK	Nutmeg Olivet
LVT-4	Tandus Centiva	CGA-3635-RG	Saffron

2. Rubber Base:

Refer to 2.3 F for Resilient Base Information

C. Welded Sheet Flooring - Resilient rubber sheet flooring with heat welded seams and Integral Cove Base (WSF):

1. Flooring:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WSF-1A:	Nora	Noraplan	2mm, TBD
WSF-2A:	Nora	Noraplan	2mm, TBD
WSF-1B:	Nora	Noraplan	3mm, TBD
WSF-2B:	Nora	Noraplan	3mm, TBD

2. Coved Base:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WSFB:	Nora	Noraplan	To match WSF

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3. Welding Rod: Coordinate with Sheet Flooring designated above

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
Rod1:	Nora	Weld Rod	To match WSF1
Rod2:	Nora	Weld Rod	To match WSF2

D. Carpeting (CPT):

1. Carpeting:

	<u>MANUFACTURER</u>	<u>PATTERN</u>	<u>COLOR</u>
CPT-1:	Interface	TBD	TBD
Install Quarter turn			

	<u>MANUFACTURER</u>	<u>PATTERN</u>	<u>COLOR</u>
CPT-2:	Interface	TBD	TBD
Install Quarter turn			

2.3 INTERIOR WALLS

A. Steel Frames:

1. Finish: Field Applied Paint finish to match PPG Industries/Matthews Paint Color palette, SG texture.

	<u>FINISH</u>	<u>COLOR</u>
P-3:	PPG/Matthews	To match WALL PAINT P-1

B. Wood Doors:

	<u>MANUFACTURER</u>	<u>FINISH</u>
MPL	Marshfield Doors	Maple-White, Quarter Sliced, Finish: Clear 0-95

C. Kick-Mop, Mop Plate and Armor Plates:

1. Refer to door schedule for location.
Finish: 630 Stainless Steel, 18 Gauge

D. Special Doors:

1. Metal Access Doors: Painted finish, color and texture to match color and texture of adjacent walls or gypsum board ceilings.
2. Glass Fiber Reinforced Ceiling Access Panels

	<u>MANUFACTURER</u>	<u>FINISH</u>
	Castle Access Panels	Pop Out/or Hinged Radius Corner Paint to match ceiling color

E. Ceramic Mosaic Wall Tiles (CT):

1. Tile Size: 6 x 12 inches.
2. Joints to align vertically and horizontally.
3. Refer to the Drawings and Interior elevations for patterns and refer to Interior Finish Schedule for locations.

	<u>MANUFACTURER</u>	<u>COLOR</u>
CT-1:	TBD	TBD

4. Coved Base Tile

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	<u>MANUFACTURER</u>	<u>COLOR</u>
PTB-1:	TBD	6x12 Cove base

5. Grout: Epoxy Grout at all locations.

	<u>MANUFACTURER</u>	<u>COLOR</u>
	Custom Building Products	Match PT-1 @ Base Tile; CT-1 @ Wall

F. Resilient Base (RB):

	<u>MANUFACTURER</u>	<u>COLOR</u>
RB-1:	Johnsonite	179 Steel, 6" High

G. Solid Surface Wall Panel (SSW)

1. 1/4" thickness

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
SSW:	Meganite	1/4" thickness	001 Bright White

H. FRP Decorative Wall Panel (Alternate#6) (FRP)

1. In lieu of SSW. Provide Clear Satin Anodized Aluminum J-Molding at top trim and any exposed edges

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
FRP:	Formica	FRPSelect	TBD

I. Plastic laminate Wall Panel System (WP)

Using PL-1, See 2.5A for PL-1

Use Reveals as detailed in Drawings

Inside Corner, Outside Corner, Recessed Horizontal Joint, Recessed Vertical Joint

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
a.	WP	Shadowline Recessed Reveal	Clear Satin Anodized

J. Interior Reveals

1. See interior elevations for locations & details for Molding types.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
410:	Fry Reglet	Specified Molding	Clear Anodized

K. Corner Guard (Rated and Non rated conditions)

1. See Floor Plan for location.

2. Flush Mounted Corner Guard, install type per wall rating.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
CG-1:	Construction Specialties Inc.	Acrovyn 4000 FS-20N @ Nonrated wall FS-20N 1HR @ Rated wall	#933 Mission White Suede Texture

L. Corner Guard (CG-2)

1. See Floor plan for location.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
CG-2:	Construction	Acrovyn 4000	#933 Mission White

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Specialties Inc. FSC-25N

Suede Texture

M. Interior Glazing

1. See Glazing schedule for details.

MANUFACTURER

GL-1 Skyline Design

3/8" Fully Tempered, Patterned Monolithic Glass, Spec No: 25369

side 1: Sateen Pattern

side 2: Sateen Pattern

N. Tackboard

1. See Interior Elevations for location
2. Wall and casework mounted

MANUFACTURERPRODUCTCOLOR

TS

Koroseal

Walltalkers

TBD

2.4 CEILING

Refer to the Reflected Ceiling Plan for Acoustic Panel type and location.

A. Acoustical Ceiling Treatment:

AT-1, AT-2 & AT-3 to be Foil backed tiles with CAC rating greater than 40

1. AT-1:

- a. Manufacturer: Armstrong World Industries.
- b. Size: 24" x 24"
- c. Product: Ultima w/Edge Profile: Square Tegalur
- d. Color: White

2. AT-2:

- a. Manufacturer: Armstrong World Industries.
- b. Size: 12" x 48" with 6" slots for linear diffusers/lighting.
- c. Product: Optima w/Edge Profile: Square Tegalur
- d. Color: White

B. Suspension System

- a. for AT-1, AT-2:

MANUFACTURERPRODUCTCOLOR

Armstrong

Silhouette 9/16"

White

Bolt slot-1/8" Reveal

2.5 ARCHITECTURAL WOODWORK

A. Plastic Laminate (PL):

MANUFACTURERCOLOR

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PL-1	Wilsonart	7953-58, Harvest Maple
------	-----------	------------------------

B. Solid Surfacing Material (SS-1)

	<u>MANUFACTURER</u>	<u>COLOR</u>
SS-1	Corian	White Jasmine(@ All Work Surfaces)

C. Quartz Surface Material (QTZ)

	<u>MANUFACTURER</u>	<u>COLOR</u>
QTZ	Cambria	0110 Snowden White (@ Reception)

D. Resin Panel

1. Application 1: Signage Feature directly adhered to wall
Acrylic Panels with custom graphic print and "PHARMACY" text.
Text to be Helvetica 55 Roman font, 7"H

	<u>MANUFACTURER</u>	<u>COLOR</u>
RP-1	3Form	Varia 1/4" Opaque

Custom Image: To be selected from: <http://henrydomke.com/>

2. Application 2: Wall Feature to be directly adhered to wall

	<u>MANUFACTURER</u>	<u>COLOR</u>
RP-2	3Form	Varia 1/4" Opaque

Custom Image: To be selected from: <http://henrydomke.com/>

- a. Application 3: Privacy partitions as detailed in drawings and specification All exposed hardware to be Anodized aluminum

	<u>MANUFACTURER</u>	<u>COLOR</u>
RP-3	3Form	Varia 1/2"
RP-3A	3Form	Varia 1"

E. Casework Hardware

Adjustable Shelf Standards and Supports

	<u>MANUFACTURER</u>	<u>TYPE</u>
	Knape & Vogt	Model 255 with 256 support

Corner Hinge	<u>MANUFACTURER</u>	<u>TYPE</u>
	Aximat	Model 300

Invisible Hinge	<u>MANUFACTURER</u>
	SOSS

Drawer Slides	<u>MANUFACTURER</u>	<u>TYPE</u>
	Accuride	Model 3832 or 7432 box drawers 4034 file drawers

Counter Support	<u>MANUFACTURER</u>	<u>TYPE</u>
	Hafele	In Wall Work Surface Brackets 287.74 Series. Sized per Counter depth

Grommets	<u>MANUFACTURER</u>	<u>TYPE</u>
	Hafele	Model 631.35.214 Color:RAL 9006

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Cabinet Pulls	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model #126.27.936 Continuous Aluminum Pulls
Label Frames	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model 168.02.761, Nickel Plated Steel

2.6 MISCELLANEOUS - INTERIOR

- A. Architecturally Exposed Aluminum: All Channel Trims in Casework and Reveal moldings in Gyp. Board walls to have a clear anodized finish.
- B. Miscellaneous Wood and Metal Requiring Paint: Grilles, access panels, pipes, except specific colors required by section "painting" & conduits (ferrous and non-ferrous) heating, ventilating and air conditioning units and connections, etc. Color to match adjoining surface, texture
- C. Aluminum Drywall Molding End Closures (CG-3)):
1. Refer to the Floor Plans for locations and dimensions.
 2. Install from floor to ceiling at all locations.
 3. Color to match Paint color of adjoining wall surface.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR/TEXTURE</u>
CG-3:	Fry Reglet	End closure Dim per Detail	Primed

- D. Window Shades (WS):
1. Shade fabric shall be Thermoplastic Olefin (TPO) fiber filaments with a TPO coating
 2. Openness factor shall be 3%

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR/TEXTURE</u>
WS:	MechoShade	EcoVeil	1570 Shadow Grey

2.8 EXTERIOR WALLS

- A. Glazing:
- | | | |
|-----|---------------------|------------------------------------|
| | <u>MANUFACTURER</u> | |
| G-1 | Viracon | To match existing exterior windows |

- B. Metal Panels:
1. Finish: Factory applied fluoropolymer coating.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
	Centria	Duranar	PPG Graham Whit

PART 3 - EXECUTION**3.1 FINISH SCHEDULE ABBREVIATIONS**

AP	Acoustical Panel
Arch.	Architectural
AWP	Acoustical Wall Panel
CSLAB	Concrete Slab

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CSI	Concrete Stain Interior
CSE	Concrete Stain Exterior
CG	Corner Guards
CLG	Ceiling
CPT	Carpet
CT	Ceramic Tile
CTB	Ceramic Tile base
EGS	Eggshell
ES	Edge Strip
EXP	Exposed
GB	Gypsum Wallboard
GL	Glass
L	Locker
LL	Low Luster
TB	Tack Board
MRGB	Moisture Resistant Gypsum Board
MTL	Metal
NF	Natural Finish
P	Paint (Exterior, Interior, Transparent Finishes)
PL	Plastic Laminate
RB	Resilient Base
RSF	Resilient Sheet Flooring
SC	Special Coating
SG	Semi-Gloss
SSM	Solid Polymer Surface
SS	Suspension System
U	Unfinished
WD	Wood
WSF	Welded Sheet Flooring
WSFB	Welded Sheet Flooring Base
WPS	Wall Panel System

3.2 GENERAL NOTES

- A. All wall paint finishes to be LL (low luster) unless otherwise noted.
- B. Refer to reflected ceiling plans for ceiling heights and details.
- C. Refer to Floor Finish Plan for Floor patterns and details.
- D. Interior Finishes to comply with max. flame spread requirements per IBC

3.3 INTERIOR COLOR AND FINISH SCHEDULE

- A. Schedule is included with the Contract Drawings.

- - - E N D - - -

SECTION 09 22 16**NON-STRUCTURAL METAL FRAMING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. 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. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- C. 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.
- E. Seismic bracing: Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

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.

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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.
5. Shop drawings to include detailing of all framing systems, details for the connections of the framing systems to the structure and details for seismic/lateral bracing.
6. Provide structural calculations for framing assemblies and connections, stamped and signed by a professional engineer licensed in the state of California.

- D. Test Results: Fire rating test designation, each fire rating required for each assembly.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

- A. 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)
1. A123-09 Zinc (Hot-dip Galvanized) Coatings on Iron and Steel Products
 2. A653/A653M-09 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
 3. A641-09 Zinc-Coated (Galvanized) Carbon Steel Wire
 4. C11-10 Terminology Relating to Gypsum and Related Building Materials and Systems
 5. C635-07 Manufacture, Performance, and Testing of Metal Suspension System for Acoustical Tile and Lay-in Panel Ceilings
 6. C636-06 Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 7. C645-09 Non-Structural Steel Framing Members
 8. C754-09 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products

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9. C841-03 (R2008) Installation of Interior Lathing and Furring
10. C954-07 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
11. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
12. E580-09 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**

- A. Galvanize steel studs, runners (track), rigid (hat section) furring channels, "Z" shaped furring channels, and resilient furring channels, with coating designation of G-60 minimum, per ASTM 123.

2.2 STEEL STUDS AND RUNNERS (TRACK)

- A. ASTM C645, modified for thickness specified and sizes as shown.
 1. Use ASTM A525 steel, 1.44 mm (0.0566-inch) thick bare metal (54 mil).
 2. Runners same thickness as studs.
- 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.
 3. E Studs.
 4. J Runners.
 5. Steel Jamb-Strut.

2.3 FURRING CHANNELS

- A. Rigid furring channels (hat shape): ASTM C645.
- B. "Z" Furring Channels:
 1. Not less than 0.45 mm (0.0179-inch)-thick bare metal, with 32 mm (1-1/4 inch) and 19 mm (3/4-inch) flanges.

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2. Web furring depth to suit thickness of insulation with slotted perforations.

- C. 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. Tie Wire and Hanger Wire:
 1. ASTM A641, soft temper, Class 1 coating.
 2. Gage (diameter) as specified in ASTM C754 or ASTM C841.
- E. 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.
- F. Power Actuated Fasteners: Type and size as recommended by the manufacturer of the material being fastened.
- G. Expansion Anchors: Tested and qualified for use in cracked concrete per ACI 355.2 and ICC-ES AC 193. Anchors to have a current ICC-ES report approved for cracked concrete (seismic) use under the 2009 IBC. Install anchors in accordance with the ICC-ES report and manufacturer's instructions. Provide stainless steel anchors for exterior use or when exposed to weather. Provide galvanized carbon steel anchors at other locations, unless otherwise noted.

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

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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 .
- F. At existing plaster ceilings and where shown, studs may terminate at ceiling as shown.
- 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

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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 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.

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3.5 INSTALLING SHAFT WALL SYSTEM

- A. Position J runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural supports with expansion anchors at both ends and 600 mm (24 inches) on center.
- B. 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.
- C. Install full-length steel E studs over shaft wall line at intersections, corners, hinged door jambs, columns, and both sides of closure panels.
- D. 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.
- B. Concrete slabs on steel decking composite construction:
 - 1. Use expansion anchors as indicated on the drawings.
- C. 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.
- D. Existing concrete construction exposed or concrete on steel decking:
 - 1. Use expansion anchors as indicated on the drawings.
- E. 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.
- F. 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.

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- 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.

G. 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.)

3.8 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

- - - E N D - - -

SECTION 09 29 00**GYPSUM BOARD****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies gypsum board systems including gypsum board, light gage metal framing, suspension system for gypsum board systems, joint treatment, acoustical accessories, and general accessories for complete installation.
- B. Provide special corner guards and end closures integral with gypsum board assemblies.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. 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.
- D. Existing Conditions: Section 02 82 11, ASBESTOS ABATEMENT. Reference VA documentation of existing asbestos locations within building at walls to remain.

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 - corner guards, end closures.
 - 2. Finishing materials.

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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. Corner guards
4. End closures
5. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.
3. Products shall be tested in the assembly, or approved equivalent assembly, as indicated on the drawings to achieve the indicated rating.

1.5 DELIVERY, IDENTIFICATION, HANDLING AND STORAGE

- A. In accordance with the requirements of ASTM C840.

1.6 ENVIRONMENTAL CONDITIONS

- A. 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):
 1. C11-08 Terminology Relating to Gypsum and Related Building Materials and Systems
 2. C475-02 Joint Compound and Joint Tape for Finishing Gypsum Board
 3. C840-08 Application and Finishing of Gypsum Board

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4. C919-08 Sealants in Acoustical Applications
 5. C954-07 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. (2.84 mm) in thickness
 6. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 7. C1047-05 Accessories for Gypsum Wallboard and Gypsum Veneer Base
 8. C1177-06 Glass Mat Gypsum Substrate for Use as Sheathing
 9. C1658-06 Glass Mat Gypsum Panels
 10. C1396-06 Gypsum Board
 11. E84-08 Surface Burning Characteristics of Building Materials
- C. Underwriters Laboratories Inc. (UL):
1. Latest Edition Fire Resistance Directory
- D. Inchcape Testing Services (ITS):
1. Latest Editions Certification Listings

PART 2 - PRODUCTS**2.1 PERFORMANCE REQUIREMENTS**

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency

2.2 GYPSUM BOARD

- A. Gypsum Board: ASTM C1396, Type X, 16 mm (5/8 inch) thick unless shown otherwise. Shall contain a minimum of 20 percent recycled gypsum.
- B. Gyp Sheathing for substrates at exterior walls, with no paper facing.
- C. 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.

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- D. Water Resistant Gypsum Backing Board: ASTM C620, Type X, 16 mm (5/8 inch) thick.
- E. C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- F. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
 - 1. Thickness: 1/2 inch.
 - 2. Long Edges: Tapered.
- G. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
 - 1. Core: 5/8 inch, Type X.
 - 2. Long Edges: Tapered.
- H. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- I. Gypsum cores shall contain a minimum of 95 percent post industrial recycled gypsum content. Paper facings shall contain 100 percent post-consumer recycled paper content.
- J. All gypsum board subject to moisture during construction or use shall have no paper facing.

2.3 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 - 1. Core: 5/8 inch, Type X.
 - 2. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
- B. Cementitious Backer Board: Fiberglass reinforced cement backer board in compliance with ASTM C1325 and ANSI A118.9, 1/2 in. thick, unless otherwise shown.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes:

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- a. Cornerbead.
- b. Bullnose bead.
- c. LC-Bead: J-shaped; exposed long flange receives joint compound.
- d. L-Bead: L-shaped; exposed long flange receives joint compound. Flanges not less than 22 mm (7/8 inch) wide with punchouts or deformations as required to provide compound bond.
- e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
- f. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.

3. Finish: Anodized aluminum finish at exposed trim, all other trim to be factory sprayed with baked-on primer to serve as base for field painting.

2.5 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.

2.6 FINISHING MATERIALS

- A. 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.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Corner Guards:
- C. Metal Wall Base
- D. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

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1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

3. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2. Recycled Content of Blankets: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

F. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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

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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 assemblies:
 - 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

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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.
4. All offices, exam rooms, consult rooms and restrooms are required to be provided with full-height acoustic partitions, whether indicated on drawings or not.

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

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- 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.
- 5. Aluminum Trim : Install in locations indicated on Drawings

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. 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.
- C. Gypsum Board:
 - 1. 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.

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2. Where coreboard is covered with face layer of gypsum board, stagger joints of face layer from those in the coreboard base.

- D. 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.
- B. Use Level 5 finish for all finished areas open to public view.
- C. 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.
- D. 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 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in

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designated containers and protect from moisture and contamination.

- - - E N D - - -

SECTION 09 30 13**CERAMIC/PORCELAIN TILING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies porcelain, quarry tile, terrazzo divider strips, solid surface thresholds, waterproofing membranes for thin-set applications, tile backer board.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.
- C. Color, texture and pattern of field tile and trim shapes, size of field tile, and color of grout specified: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Metal and resilient edge strips at joints with new resilient flooring,: Section 09 65 19, RESILIENT TILE FLOORING.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Base tile, each type, each color, each size.
 - 2. Porcelain tile, each type, color, patterns and size.
 - 3. Wall (or wainscot) tile, each color, size and pattern.
 - 4. Solid surface threshold
 - 5. 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.
- C. Product Data:
 - 1. Ceramic and porcelain tile, marked to show each type, size, and shape required.
 - 2. Chemical resistant grout (Epoxy).
 - 3. Cementitious backer unit.
 - 4. Dry-set Portland cement mortar and grout.
 - 5. Divider strip.

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6. Elastomeric waterproofing and crack-isolation membrane.
7. Reinforcing tape.
8. Leveling compound.
9. Slip resistant tile.
10. Fasteners.

D. Certification:

1. Master grade, ANSI A137.1.
2. Manufacturer's certificates indicating that the following materials comply with specification requirements:
 - a. Chemical resistant grout (epoxy).
 - b. Cementitious backer unit.
 - c. Dry-set Portland cement mortar and grout.
 - d. Elastomeric waterproofing and crack-isolation membrane.
 - e. Reinforcing tape.
 - f. Leveling compound.

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. American National Standards Institute (ANSI):
 1. A10.20-05 Safety Requirements for Ceramic Tile, Terrazzo, and Marble Works
 2. A108.1A-05 Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar
 3. A108.1B-05 Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with dry-Set or latex-Portland Cement Mortar
 4. A108.1C-05 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
 5. A108.4-05 Installation of Ceramic Tile with Organic Adhesives or Water Cleanable Tile Setting Epoxy Adhesives
 6. A108.5-05 Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar
 7. A108.6-05 Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy

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8. A108.8-05 Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout
9. A108.10-05 Installation of Grout in Tilework
10. A108.11-05 Interior Installation of Cementitious Backer Units
11. A108.13-05 Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone
12. A118.1-05 Dry-Set Portland Cement Mortar
13. A118.3-05 Chemical Resistant, Water Cleanable Tile-Setting Epoxy and Water Cleanable Tile-Setting and Grouting Epoxy Adhesive
14. A118.5-05 Chemical Resistant Furan Mortars and Grouts for Tile Installation
15. A118.6-05 Standard Cement Grouts for Tile Installation
16. A118.9-05 Cementitious Backer Units
17. A118.10-05 Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation
18. A137.1-88 Ceramic Tile

C. American Society For Testing And Materials (ASTM):

1. A185-07 Steel Welded Wire Fabric, Plain, for Concrete Reinforcing
2. C109/C109M-07 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 inch. or (50-mm) Cube Specimens)
3. C241-90 (R2005) Abrasion Resistance of Stone Subjected to Foot Traffic
4. C348-02 Standard Test Method for Flexural Strength of Hydraulic- Cement Mortars
5. C627-93(R2007) Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester
6. C954-07 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 in thickness)
7. C979-05 Pigments for Integrally Colored Concrete
8. C1002-07 Steel Self-Piercing Tapping Screws for the Application of Panel Products
9. C1027-99(R2004) Determining "Visible Abrasion Resistance on Glazed Ceramic Tile"
10. C1028-07 Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method
11. C1127-01 Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
12. D4397-02 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications

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13. D5109-99(R2004) Standard Test Methods for Copper-Clad Thermosetting Laminates for Printed Wiring Boards

D. Marble Institute of America (MIA):

1. Design Manual III-2007

E. Tile Council of America, Inc. (TCA):

1. 2007 Handbook for Ceramic Tile Installation

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 C 1027.
 - b. Class V, 12000 revolutions for floors in Corridors, Kitchens, Storage including Refrigerated Rooms
 - c. Class IV, 6000 revolutions for remaining areas.
3. Slip Resistant Tile for Floors:
 - a. Coefficient of friction, when tested in accordance with ASTM C1028, required for level of performance:
 - 1) Not less than 0.7 (wet condition) for bathing areas.
 - 2) Not less than 0.8 on ramps for wet and dry conditions.
 - 3) Not less than 0.6, except 0.8 on ramps as stated above, for wet and dry conditions for other areas.
 - b. Tile Having Abrasive Grains:
 - 1) Unglazed Ceramic Mosaic Tile: Abrasive grains throughout body of the tile.
 - 2) Quarry Tile: Abrasive grains uniformly embedded in face at rate of approximately 7.5 percent of surface area.
 - c. Porcelain Paver Tile: Matte surface finish.
4. Do not use back mounted tiles in showers unless certified by manufacturer as noted in paragraph 1.3.D.
5. 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 package show the same range in colors as those taken from other packages and match approved samples.
6. 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 petroleum paraffin wax, applied hot.
 - b. Do not coat unexposed tile surfaces.
 - c. Pre-wax tiles grouted with epoxy

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- B. Unglazed Quarry Tile: Nominal 13 mm (1/2 inch) thick, square edges.
- C. Porcelain Paver Tile: Nominal 8 mm (5/16 inch) thick, with cushion edges. Porcelain tile produced by the dust pressed method shall be made of approximately 50% feldspar; the remaining 50% shall be made up of various high-quality light firing ball clays yielding a tile with a water absorption rate of 0.5% or less and a breaking strength of between 390 to 400 pounds.
- D. Trim Shapes:
 - 1. Conform to applicable requirements of adjoining floor and wall tile.
 - 2. Use slip resistant trim shapes for horizontal surfaces of showers,.
 - 3. Use trim shapes sizes conforming to size of adjoining field wall tile unless detailed or specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 4. Internal and External Corners:
 - a. Square internal and external corner joints are not acceptable.
 - b. External corners including edges: Use special trim pieces
 - 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 flush vertical and horizontal joint edge.

2.2 CEMENTITIOUS BACKER UNITS

- A. Use in showers or wet areas.
- B. ANSI A118.9.
- C. Use Cementitious backer units in maximum available lengths.
- D. Backer unit meet or exceed the following additional physical properties:
 - 1. Water absorption: Less than 20 percent by weight; per ASTM C948.

2.3 JOINT MATERIALS FOR CEMENTITIOUS BACKER UNITS

- A. Reinforcing Tape: Vinyl coated woven glass fiber mesh tape, open weave, 50 mm (2 inches) Tape with pressure sensitive adhesive backing will not be permitted.
- B. Joint material, including reinforcing tape, and tape embedding material, shall be as specifically recommended by the backer unit manufacturer.

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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.

2.5 SETTING MATERIALS OR BOND COATS

- A. Conform to TCNA Handbook for Ceramic, Glass, and Stone Tile Installation.
- B. Latex-Portland Cement Mortar: ANSI A118.4 and ISO 13007 C2S1.
 - 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.
- C. Medium-Bed, Latex-Portland Cement Mortar: Comply with requirements in ANSI A118.4 and ISO 13007 C2TS1. Provide product that is approved by manufacturer for application thickness of 20 mm (3/4 inch).
 - 1. 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. Elastomeric Waterproofing and Crack-Isolation Membrane:
 - 1. ANSI A118.10. Fluid-applied system consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement, having the following physical properties:
 - a. Fungus Resistance (ANSI A118.10): Pass
 - b. Seam Strength (ANSI A118.10): At least 95 lbs./inch (166.4 N/cm) width.
 - c. Breaking Strength (ANSI A118.10): At least 2400 lbs./in² (16.5 MPa).
 - d. Dimensional Stability (ANSI A118.10): No change.
 - e. Waterproofness (ANSI A118.10): Pass.
 - f. Shear Strength (ANSI A118.10): At least 280 lbs./in² (1.9 MPa).
 - g. Crack Suppression (ANSI A118.12): Pass 1/8 inch (3mm).

2.6 GROUTING MATERIALS

- A. Latex-Portland Cement Grout: ANSI A118.6 and ISO 13007 CG2WAF; color as specified.
 - 1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.

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2. Sanded grout mixture for joints 3.2 mm (1/8 inch) and wider.

- B. Epoxy Grout: ANSI A118.3 and ISO 13007 RG, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.
- C. Grout Sealer: Manufacturer's standard product for sealing cementitious grout joints and that does not change color or appearance of grout.

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. Shall have minimum following 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 - 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 100 mm (four 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 SOLID SURFACING THRESHOLD

- A. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.
- B. Solid Surfacing threshold: 1/2-inch thick; flush to flooring finish and beveled with a slope no steeper than 1:2.

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.
- C. Embedded leg perforated and deformed for keying to mortar.

2.10 WATER

- A. Clean, potable and free from salts and other injurious elements to mortar and grout materials.

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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 not acceptable.

2.12 POLYETHYLENE SHEET

- A. Polyethylene sheet conforming to ASTM D4397.
- B. Nominal thickness: 0.15 mm (six mils).
- C. Use sheet width to minimize joints.

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 installation and not less than three 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 fourth 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 1 in 500 (1/4 inch in 10 feet) from required elevation where Portland cement mortar setting bed is used.
 - 2. Not more than 1 in 1000 (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 1 in 400 (1/4 inch in eight feet) from required plane where Portland cement mortar setting bed is used.
 - 2. Not more than 1 in 800 (1/8 inch in eight feet) where dry-set or

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latex-Portland cement mortar or organic adhesive setting materials is used.

3.3 SURFACE PREPARATION**A. Cleaning New Concrete:**

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.
 - b. Float finish except finish smooth for elastomeric waterproofing.
 - 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.
2. Install mortar bed in depressed slab sloped to drains not less than 1 in 200 (1/16 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 days. Do not use curing compounds or coatings.

D. Additional preparation of concrete floors for tile set with epoxy, or furan-resin shall be in accordance with the manufacturer's printed instructions.

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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 A108.1.C.
 - 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 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.

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- B. Install in accordance with ANSI A108.11 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 200 mm (eight 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 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 METAL DIVIDER STRIPS

- A. Install metal divider strips in floor joints between tile floors and adjacent flooring of other materials where the finish floors are flush unless shown otherwise.
- 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 TCA "Handbook for Ceramic Tile Installation" Vertical and Horizontal Joint Design Essentials. TCA System EJ 171-02.
 - 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.

3.6 CERAMIC TILE - GENERAL

- A. Comply with ANSI A108 series of tile installation standards in

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"Specifications for Installation of Ceramic Tile" applicable to methods of installation.

B. Comply with TCA Installation Guidelines:

C. Installing Mortar Beds for Floors:

1. Install mortar bed to 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 where shown, float finish.
4. For thin set systems cure mortar bed not less than seven 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.

D. 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, TCA System F121-02 or F111-02.
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 ANSI 108. 13, TCA System F122 where scheduled.
5. Set wall tile installed over concrete or masonry in dry-set Portland cement mortar, or latex-Portland cement mortar, ANSI 108.1B.and TCA System W211-02, W221-02 or W222-02.
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, TCA System W231-02, W241-02.
8. Set tile over concrete in therapeutic pools in Portland cement paste or dry set Portland cement mortar, ANSI A108.1C, TCA System S151-02
9. Set tile installed over gypsum board and gypsum plaster in organic adhesive, ANSI A108.4, TCA System W242-02.
10. Set trim shapes in same material specified for setting adjoining tile.

E. Workmanship:

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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.
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 shall 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 shown.
 - c. In areas where floor drains occur, slope to drains where shown.
 - d. Shove and vibrate tiles over 200 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 shown with tile.
 - b. Finish reveals of openings with tile, except where other finish materials are shown or specified.
 - c. At window openings, provide tile stools and reveals, except where other finish materials are shown or specified.
 - d. 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.
 - 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

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mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 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 200 by 200 mm (8 by 8 inches or larger).
- d. Exterior tile wall installations.

3.7 THIN SET CERAMIC AND PORCELAIN TILE INSTALLED WITH DRY-SET PORTLAND CEMENT AND LATEX-PORTLAND CEMENT MORTAR

- A. Installation of Tile: ANSI A108.5, except as specified otherwise.
- B. Slope tile work to drains not less than 1 in 100 (1/8 inch per foot).

3.8 CERAMIC AND PORCELAIN TILE INSTALLED WITH ELASTOMERIC BOND COAT

- A. Surface Preparation: Prepare surfaces as specified in paragraph 3.3G
- B. Installation of Elastomeric Membrane: ANSI A108.13 and TCA F122-02.
 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 0.75 to 1.3 mm (30 to 50 mils).
 3. Extend material over flashing rings of drains and turn up vertical surfaces not less than 100 mm (four 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 (one 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 of aggregate surfacing specified in ASTM C1127. Do not install top coat over tile.

3.9 GROUTING

- A. Grout Type and Location:
 1. Grout for floor tiles: Epoxy grout.
 2. Grout for wall tiles: Sanded latex portland cement grout.

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3. Grout Sealer: Apply grout sealer to cementitious grout joints according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer from tile faces by wiping with soft cloth

- B. Workmanship:

1. Install and cure grout in accordance with the applicable standard.
2. Portland Cement grout: ANSI A108.10.

3.10 MOVEMENT JOINTS

- A. Prepare tile expansion, isolation, construction and contraction joints for installation of sealant. Refer to Section 07 92 00, JOINT SEALANTS.
- B. TCA details EJ 171-02.
- C. At expansion joints, rake out joint full depth of tile and setting bed and mortar bed. Do not cut waterproof or isolation membrane.
- D. Rake out grout at joints between tile, service sink, at toe of base, and where shown not less than 6 mm (1/4 inch) deep.

3.11 CLEANING

- A. Thoroughly sponge and wash tile. Polish glazed surfaces with clean dry cloths.
- B. Methods and materials used shall not 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.

3.12 PROTECTION

- A. Keep traffic off tile floor, until grout and setting material is firmly set and cured.
- B. Where traffic occurs over tile floor, 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.

3.13 TESTING FINISH FLOOR

- A. Test floors in accordance with ASTM C627 to show compliance with codes 1 through 10.

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3.14 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 09 51 00**ACOUSTICAL CEILINGS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Metal ceiling suspension system for acoustical ceilings.
- B. Acoustical units.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Color, pattern, size and location of each type of acoustical unit:
 - 1. Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Acoustical units, each type, with label indicating conformance to specification requirements, including units specified to match existing.
 - 2. Colored markers for units providing access.
- C. Manufacturer's Literature and Data:
 - 1. Ceiling suspension system, each type, showing complete details of installation, including suspension system specified to match existing and upward access system details for concealed grid systems.
 - 2. Acoustical units, each type
 - 3. Runners designed for snap-in attachment of metal pans.
- D. Manufacturer's Certificates: Acoustical units, each type, in accordance with specification requirements.

1.4 DEFINITIONS

- A. Standard definitions as defined in ASTM C634.
- B. Terminology as defined in ASTM E1264.

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1.5 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 Society for Testing and Materials (ASTM):
1. A641/A641M-03 Zinc-coated (Galvanized) Carbon Steel Wire
 2. A653/A653M-07 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-coated (Galvannealed) by the Hot-Dip Process
 3. C423-07 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 4. C634-02 (E2007) Standard Terminology Relating to Environmental Acoustics
 5. C635-04 Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 6. C636-06 Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels
 7. E84-07 Surface Burning Characteristics of Building Materials
 8. E119-07 Fire Tests of Building Construction and Materials
 9. E413-04 Classification for Rating Sound Insulation.
 10. E580-06 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint
 11. E1264-(R2005) Classification for Acoustical Ceiling Products

PART 2 - PRODUCTS**2.1 METAL SUSPENSION SYSTEM**

- A. ASTM C635, heavy-duty system. See Section 09 06 00 for Ceiling Grid type
1. Ceiling suspension system members may be fabricated from either of the following unless specified otherwise.
 - a. Galvanized cold-rolled steel, bonderized.
 - b. Extruded aluminum.
 - c. Fire resistant plastic (glass fiber) having a flame spread and smoke developed rating of not more than 25 when tested in accordance with ASTM E84.
 2. Use same construction for cross runners as main runners. Use of lighter-duty sections for cross runners is not acceptable.
- B. Exposed grid suspension system for support of panels:
1. Exposed grid width not less than 22 mm (7/8 inch) with not less than 8 mm (5/16 inch) panel bearing surface.
 2. Fabricate wall molding and other special molding from the same

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material with same exposed width and finish as the exposed grid members.

3. On exposed metal surfaces apply baked-on enamel flat texture finish in color to match adjacent acoustical units unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

2.2 PERIMETER SEAL

- A. Vinyl, polyethylene or polyurethane open cell sponge material having density of 1.3 plus or minus 10 percent, compression set less than 10 percent with pressure sensitive adhesive coating on one side.
- B. Thickness as required to fill voids between back of wall molding and finish wall.
- C. Not less than 9 mm (3/8 inch) wide strip.

2.3 WIRE

- A. ASTM A641.
- B. For wire hangers: Minimum diameter 2.68 mm (0.1055 inch).
- C. For bracing wires: Minimum diameter 3.43 mm (0.1350 inch).

2.4 ANCHORS AND INSERTS

- A. Use anchors or inserts to support twice the loads imposed by hangers attached thereto.
- B. Clips:
 1. Galvanized steel.
 2. Designed to clamp to steel beam or bar joists, or secure framing member together.
 3. Designed to rigidly secure framing members together.
 4. Designed to sustain twice the loads imposed by hangers or items supported.

2.5 CARRYING CHANNELS FOR SECONDARY FRAMING

- A. Fabricate from cold-rolled or hot-rolled steel, black asphaltic paint finish, free of rust.
- B. Weighing not less than the following, per 300 m (per thousand linear feet):

Size mm	Size Inches	Cold-rolled Kg Pound	Hot-rolled Kg Pound
38	1 1/2	215.4 475	508 1120
50	2	267.6 590	571.5 1260

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2.6 ACOUSTICAL UNITS**A. General:**

1. Ceiling Tile shall meet minimum 37 percent bio-based content in accordance with USDA Bio-Preferred Product requirements.
2. ASTM E1264, weighing 3.6 kg/m² (3/4 psf) minimum for mineral fiber panels or tile.
3. Class A Flame Spread: ASTM 84
4. Minimum NRC (Noise Reduction Coefficient): 0.55 unless specified otherwise: ASTM C423.
5. Minimum CAC (Ceiling Attenuation Class): 40-44 range unless specified otherwise: ASTM E413.
6. Manufacturers standard finish, minimum Light Reflectance (LR) coefficient of 0.75 on the exposed surfaces, except as specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
7. Lay-in panels: Sizes as shown. See section 090600, with reveal edges.
8. Tile for concealed grid upward access system: Optional 300 by 300 or 300 by 600 mm (12 by 12 or 12 by 24 inch) size.
 - a. Cross score 300 by 600 mm (12 by 24 inch) tile to simulate 300 by 300 mm (12 by 12 inch) tile edges.
 - b. Provide tile with beveled edges and joints as required to suit suspension and access system.

- B. Type IV Units - Mineral base with membrane-faced overlay, Form 2 - Water felted, minimum 16 mm (5/8 inch) thick. Apply over the paint coat on the face of the unit a poly (vinyl) chloride overspray having a flame spread index of 25 or less when tested in accordance with ASTM E84.

2.7 ACCESS IDENTIFICATION**A. Markers:**

1. Use colored markers with pressure sensitive adhesive on one side.
2. Make colored markers of paper or plastic, 6 to 9 mm (1/4 to 3/8 inch) in diameter.

- B. Use markers of the same diameter throughout building.

C. Color Code: Use 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

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PART 3 - EXECUTION**3.1 CEILING TREATMENT**

- A. Treatment of ceilings shall include sides and soffits of ceiling beams, furred work 600 mm (24 inches) wide and over, and vertical surfaces at changes in ceiling heights unless otherwise shown. Install acoustic tiles after wet finishes have been installed and solvents have cured.
- B. Lay out acoustical units symmetrically about center lines of each room or space unless shown otherwise on reflected ceiling plan.
- C. 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.
- D. 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.

3.2 CEILING SUSPENSION SYSTEM INSTALLATION

- A. General:
 - 1. Install metal suspension system for acoustical tile and lay-in panels in accordance with ASTM C636, except as specified otherwise.
 - 2. Use direct or indirect hung suspension system or combination thereof as defined in ASTM C635.
 - 3. Support a maximum area of 1.48 m² (16 sf) of ceiling per hanger.
 - 4. Prevent deflection in excess of 1/360 of span of cross runner and main runner.
 - 5. Provide extra hangers, minimum of one hanger at each corner of each item of mechanical, electrical and miscellaneous equipment supported by ceiling suspension system not having separate support or hangers.
 - 6. Provide not less than 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,
 - 7. Use main runners not less than 1200 mm (48 inches) in length.
 - 8. Install hanger wires vertically. Angled wires are not acceptable except for seismic restraint bracing wires.
 - 9. Provide trapeze structures as shown on the drawings where required at obstructions above ceiling.

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B. Anchorage to Structure:

1. Concrete:

- a. Install hanger inserts and wire loops required for support of hanger and bracing wire in concrete forms before concrete is placed. Install hanger wires with looped ends through steel deck if 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. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels for attachment of hanger wires.
 - 1) Size and space carrying channels to insure that the maximum deflection specified will not be exceeded.
 - 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 fire proofing is installed. Weld or use steel clips to attach to beam to develop full strength of carrying channel.
- 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.

C. Direct Hung Suspension System:

1. As illustrated in ASTM C635.
2. Support main runners by hanger wires attached directly to the structure overhead.
3. 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.

D. Seismic Ceiling Bracing System:

1. Construct system in accordance with ASTM E580.
2. Connect bracing wires to structure above as specified for anchorage to structure and to main runner or carrying channels

3.3 ACOUSTICAL UNIT INSTALLATION

- A. Cut acoustic units for perimeter borders and penetrations to fit tight against penetration for joint not concealed by molding.
- B. Install lay-in acoustic panels in exposed grid with not less than 6 mm (1/4 inch) bearing at edges on supports.

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1. Install tile to lay level and in full contact with exposed grid.
2. Replace cracked, broken, stained, dirty, or tile not cut for minimum bearing.

C. Markers:

1. Install markers of color code specified to identify the various concealed piping, mechanical, and plumbing systems.
2. Attach colored markers to exposed grid on opposite sides of the units providing access.
3. Attach marker on exposed ceiling surface of upward access acoustical unit.

3.4 CLEAN-UP AND COMPLETION

- A. Replace damaged, discolored, dirty, cracked and broken acoustical units.
- B. Leave finished work free from defects.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 09 65 13**RESILIENT BASE AND ACCESSORIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the installation of vinyl or rubber base.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Color and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Integral base with sheet flooring: Section 09 65 16, RESILIENT SHEET FLOORING.

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.
 - 2. Base and stair material manufacturer's recommendations for adhesives.
 - 3. Application and installation instructions.
- C. Samples:
 - 1. Base: 150 mm (6 inches) long, each type and color.
 - 2. Adhesive: Literature indicating each type.

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 will be rejected.

1.5 STORAGE

- A. Store materials in weather tight and dry storage facility.
- B. Protect material from damage by handling and construction operations before, during, and after installation.

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1.6 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. American Society for Testing and Materials (ASTM):
 - 1. F1344-10 Rubber Floor Tile
 - 2. F1859-10 Rubber Sheet Floor Covering without Backing
 - 3. F1860-10 Rubber Sheet Floor Covering with Backing
 - 4. F1861-08 Resilient Wall Base
- C. Federal Specifications (Fed. Spec.):
 - 1. RR-T-650E Treads, Metallic and Non-Metallic, Nonskid

PART 2 - PRODUCTS**2.1 GENERAL**

- A. Use only products by the same manufacturer and from the same production run.

2.2 RESILIENT BASE

- A. ASTM F1861, 100 mm (6 inches) high, Type TP Rubber, Thermoplastics, Group 2-layered with molded top. Style B-cove.
- B. Where carpet occurs, use Style A-straight.
- C. Use only one type of base throughout.

2.3 ADHESIVES

- A. Use products recommended by the material manufacturer for the conditions of use.
- B. Use low-VOC adhesive during installation. Water based adhesive with low VOC is preferred over solvent based adhesive.

PART 3 - EXECUTION**3.1 PROJECT CONDITIONS**

- A. Maintain temperature of materials above 21° C (70° F), for 48 hours before installation.
- B. Maintain temperature of rooms where work occurs, between 21° C and 27° C (70° F and 80° F) for at least 48 hours, before, during, and after installation.

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- C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.

3.2 INSTALLATION REQUIREMENTS

- A. The respective manufacturer's instructions for application and installation will be considered for use when approved by the Resident Engineer.
- B. Submit proposed installation deviation from this specification to the Resident Engineer indicating the differences in the method of installation.
- C. The Resident Engineer reserves the right to have test portions of material installation removed to check for non-uniform adhesion and spotty adhesive coverage.

3.3 PREPARATION

- A. Examine surfaces on which material is to be installed.
- B. Fill cracks, pits, and dents with leveling compound.
- C. Level to 3 mm (1/8 inch) maximum variations.
- D. Do not use adhesive for leveling or filling.
- E. Clean substrate area of oil, grease, dust, paint, and deleterious substances.
- F. Substrate area dry and cured. Perform manufacturer's recommended bond and moisture test.
- G. Preparation of existing installation:
 - 1. Remove existing base including adhesive.
 - 2. Do not use solvents to remove adhesives.
 - 3. Prepare substrate as specified.

3.4 BASE INSTALLATION

- A. Location:
 - 1. Unless otherwise specified or shown, where base is scheduled, install base over toe space of base of casework, lockers, laboratory, pharmacy furniture island cabinets and where other equipment occurs.
 - 2. Extend base scheduled for room into adjacent closet, alcoves, and around columns.
- B. Application:
 - 1. Apply adhesive uniformly with no bare spots.
 - 2. Set base with joints aligned and butted to touch for entire height.

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3. Before starting installation, layout base material to provide the minimum number of joints with no strip less than 600 mm (24 inches) length.
 - a. Short pieces to save material will not be permitted.
 - b. Locate joints as remote from corners as the material lengths or the wall configuration will permit.
- C. Form corners and end stops as follows:
 1. Score back of outside corner.
 2. Score face of inside corner and notch cove.
- D. Roll base for complete adhesion.

3.5 CLEANING AND PROTECTION

- A. Clean all exposed surfaces of base and adjoining areas of adhesive spatter before it sets.
- B. Keep traffic off resilient material for at least 72 hours after installation.
- C. Clean and polish materials in the following order:
 1. After two weeks, scrub resilient base, sheet rubber and treads materials with a minimum amount of water and a mild detergent. Leave surfaces clean and free of detergent residue. Polish resilient base to a gloss finish.
 2. Do not polish tread and sheet rubber materials.
- D. When construction traffic is anticipated, cover tread materials with reinforced kraft paper and plywood or hardboard properly secured and maintained until removal is directed by the Resident Engineer.
- E. Where protective materials are removed and immediately prior to acceptance, replace damaged materials and re-clean resilient materials. Damaged materials are defined as having cuts, gouges, scrapes or tears and not fully adhered.

3.6 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 09 65 16**RESILIENT SHEET FLOORING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This Section specifies the installation of sheet flooring with backing and integral cove base.
- B. Rubber sheet floor 2.00 mm and 3.00 mm at locations as specified. Floor covering with abundant natural fillers and environmentally compatible color pigments
- C. Installation of sheet flooring including following:
 - 1. Heat welded seams.
 - 2. Integral cove base: Installed at intersection of floor and vertical surfaces.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Resilient base over base of lockers, equipment and casework: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 QUALITY CONTROL - QUALIFICATIONS:

- A. The Contracting Officer shall approve products or service of proposed manufacturer, suppliers, and installers, and the Contractor shall submit certification that:
 - 1. Heat welded seaming is manufacturer's prescribed method of installation.
 - 2. Installer is approved by manufacturer of materials and has technical qualifications, experience, trained personnel, and facilities to install specified items.
 - 3. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience with resilient flooring of type's equivalent to those specified. Manufacturers proposed for use, which are not named in this section, should submit evidence of ability to meet performance requirements specified not less than 10 days prior to bid date
 - 4. Color Matching: Provide resilient flooring products, including wall

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base, accessories and subfloor preparation products from one manufacturer to ensure color matching and compatibility.

5. Manufacturer must be capable of providing technical training and technical field service representation.
 6. Manufacturer's product submitted has been in satisfactory operation, on three installations similar and equivalent in size to this project for three years. Submit list of installations.
- B. The sheet floor coverings shall meet fire performance characteristics as determined by testing products, per ASTM test method, indicated below by Underwriters Laboratories, Inc. (UL) or another recognized testing and inspecting agency acceptable to authorities having jurisdiction.
1. Flammability: ASTM E648; NFPA 253; NBSIR 75 950, ≥ 0.45 watts per square centimeter, Class 1
 2. Smoke Density: ASTM E662, NFPA 258, NBS smoke density, < 450
- C. The floor covering manufacturer shall certify that products supplied for installation comply with local regulations controlling use of volatile organic compounds (VOC's).

1.4 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, submit following:
- B. Manufacturer's Literature and Data:
1. Description of resilient material and accessories to be provided.
 2. Resilient material manufacturer's recommendations for adhesives, weld rods, sealants, and underlayment.
 3. Application and installation instructions.
- C. Samples:
1. Sheet material, 38 mm by 300 mm (1-1/2 inch by 12 inch), of each color and pattern with a welded seam using proposed welding rod.
 2. Cap strip and fillet strip, 300 mm (12 inches) for integral base.
 3. Shop Drawings and Certificates: Layout of joints showing patterns where joints are expressed, and type and location of obscure type joints. Indicate orientation of directional patterns.
 4. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.
 5. Edge strips: 150 mm (6 inches) long each type.
 6. Adhesive, underlayment and primer: Pint container, each type.

1.5 PROJECT CONDITIONS

- A. Maintain temperature and humidity at service levels or 68° F (20° C), $\pm 5^\circ$ F (3° C), and 50% RH $\pm 10\%$ in areas to receive resilient flooring. Specified temperature should be maintained at least 48 hours before,

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during, and 72 hours after installation.

- B. Construction in or near areas to receive flooring work shall be complete, dry and cured. Do not install resilient flooring over slabs until they have been cured and are sufficiently dry to achieve a bond with adhesive. Follow flooring manufacturer's recommendations for bond and moisture testing.
- C. Building shall be permanently enclosed. Schedule construction so that floor receives no construction traffic when completed.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.
- B. Deliver sheet flooring full width roll, completely enclosed in factory wrap, clearly marked with the manufacturer's number, type and color, production run number and manufacture date.
- C. Store materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before, during and after installation. Store sheet flooring on end with ambient temperatures maintained as recommended by manufacturer.
- D. Store sheet flooring on end.
- E. Move sheet floor coverings and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

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. American Society For Testing Materials (ASTM):
 - 1. ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
 - 2. ASTM C518 Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 - 3. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
 - 4. ASTM D2047 Standard Test Method for Static Coefficient of Friction of Polish-Coated Floor Surfaces as Measured by the James Machine
 - 5. ASTM D2240 Standard Test Method for Rubber Property - Durometer Hardness
 - 6. ASTM D3389 Standard Test Method for Coated Fabrics Abrasion Resistance (Rotary Platform, Double Head Abrader)
 - 7. ASTM D6499 Standard Test Method for The Immunological Measurement of Antigenic Protein in Natural Rubber and its Products
 - 8. ASTM E84 Standard Test Method for Surface Burning Characteristics of

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Building Materials

9. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
10. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
11. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
12. ASTM E1745 Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
13. ASTM E2179 Standard Test Method for Laboratory Measurement of the Effectiveness of Floor Coverings in Reducing Impact Sound

Transmission Through Concrete Floors

14. ASTM E2180 Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials
15. ASTM F150 Standard Test Method for Electrical Resistance of Conductive and Static Dissipative Resilient Flooring
16. ASTM F155 Method of Test for Temper of Strip and Sheet Metals for Electronic Devices
17. ASTM F386 Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
18. ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
19. ASTM F925 Standard Test Method for Resistance to Chemicals of Resilient Flooring
20. ASTM F970 Standard Test Method for Static Load Limit
21. ASTM F1344 Standard Specification for Rubber Floor Tile
22. ASTM F1482 Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
23. ASTM F1514 Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color
24. ASTM F1859 Standard Specification for Rubber Sheet Floor Covering Without Backing
25. ASTM F1860 Standard Specification for Rubber Sheet Floor Covering With Backing
26. ASTM F1861 Standard Specification for Resilient Wall Base
27. ASTM F2055 Standard Test Method for Size and Squareness of Resilient Floor Tile by Dial Gage Method
28. ASTM F2169 Standard Specification for Resilient Stair Treads
29. ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
30. ASTM F2199 Standard Test Method for Determining Dimensional Stability of Resilient Floor Tile after Exposure to Heat

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31. ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings
32. ASTM G21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Resilient Floor Covering Institute (RFCI):

1. Recommended Work Practices for Removal of Resilient Floor Coverings.

D. International Organization for Standardization

1. ISO 140 Measurement of sound insulation in buildings and of building elements

E. National Fire Protection Association

1. NFPA 253 Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
2. NFPA 258 Test Method for Specific Density of Smoke Generated by Solid Materials

1.8 SCHEDULING

- A. Interior finish work such as plastering, drywall finishing, concrete, terrazzo, ceiling work, and painting work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed. Heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.9 WARRANTY:

- A. Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to include two (2) years.

PART 2 - PRODUCTS

2.1 RUBBER FLOOR COVERINGS

- A. Rubber Floor Coverings: Smooth coverings- 3mm & 2mm thickness

TYPE 1:2mm thickness

1. ASTM Specification: ASTM F1344 Standard Specification for Rubber Floor Tile, defined as Type I and Grade 1

4. Material: vulcanized rubber compound 913 with environmentally compatible color pigments that are free of toxic heavy metals like lead,

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cadmium or mercury

5. Composition: Homogeneous rubber compound with a random scattered design

7. Surface: Smooth

8. Back of Tile/Sheet/Nosing: Double-sanded smooth

9. Material Size: ~24 inches by 24 inches (610mm by 610mm) per ASTM F2055 ± 0.018 (± 0.45 mm) is required

11. Squareness: ASTM F2055, ± 0.018 inches (± 0.45 mm) is required

12. Thickness: 0.08 inches (2mm), ASTM F386, ± 0.005 inches (± 0.127 mm) is required

14. Dimensional Stability: ASTM F2199, $\leq 0.15\%$ in both directions is required

15. Flammability: ASTM E648; NFPA 253; NBSIR 75 950, 0.97 achieved, ≥ 0.45 watts/sq. cm for Class 1 is required

16. Smoke Density: ASTM E662; NFPA 258; NBS, 196 (flaming) and 207 (non-flaming) achieved, < 450 is required

18. CAN/ULC-S102.2: Surface Burning, FSC1 of 125 and SD of 370, achieved

19. Burn Resistance: Resistant to cigarette and solder burns

20. Slip Resistance: ASTM D2047 Static coefficient of friction, Neolite dry 0.96, Neolite wet 0.85 achieved, ≥ 0.5 is required (not recommended for ramps)

21. Bacteria Resistance: ASTM E2180 and ASTM G21, resistant to bacteria, fungi, and micro-organism activity

22. VOC's: Flooring to be GREENGUARD Gold Certified for Low VOC Emissions, GREENGUARD Certified for Low VOC Emissions, Blue Angel Certified and CA 01350 Compliant

24. Sound Absorption: ASTM E2179 Δ IIC 11, ISO 140 Δ Lw 8 dB (compare only Δ values)

26. Hardness: ASTM D2240, Shore type "A", 92 achieved, ≥ 85 is required

27. Static Load: ASTM F970, Residual compression of 0.003" with 800 lbs. achieved, ≤ 0.005 " with 250 lbs. is required

28. Rolling Load Limit: ≤ 450 lbs. / sq. inch, with no forklift traffic

29. Abrasion Resistance: ASTM D3389, 1.1 lbs. (500g) load on H-18 wheel with 1000 cycles, 0.008 oz. (0.24g) weight loss achieved, ≤ 0.035 oz. (1.0g) is required

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30. Elongation: ASTM D412 Modulus @ 10% is 866.8 lbs. per sq. inch achieved, ≥ 300 lbs. per sq. inch is required

32. Heat Resistance: ASTM F1514, Avg. $\Delta E \leq 8.0$ is required, easily achieved with all batches and regular maintenance

33. Light Resistance: ASTM F1515, Avg. $\Delta E \leq 8.0$, easily achieved with all batches and regular maintenance

34. Static Generation: AATCC 134, < 2000 Volts at 20% RH, achieved

37. Thermal Transmission: ASTM C518, R-value 0.04, achieved

38. Shine: Higher shine should be achieved by buffing without any artificial topical applied coatings

39. Stain Removal: Samples of the product shall be provided for stain removal testing by the owner. Sample size shall be 24 inches by 24 inches, pre-cleaned by manufacture per published recommendations. Samples shall have no coatings, sealers, floor finish or other manually or mechanically applied finish on the surface of the product. Stain testing shall consist of application of common healthcare related disinfectants and chemicals to include, but not limited to, Betadine, Methylene Blue, Silver Nitrate and alcohol based hand sanitizer. Duration of test period shall be no less than one week. Removal of chemicals shall be in accordance with manufacturers published cleaning and maintenance recommendations.

TYPE 2: 3mm thickness

2. ASTM Specification: ASTM F1344 Standard Specification for Rubber Floor Tile, defined as Type I and Grade 1

5. Composition: Homogeneous rubber compound with a random scattered design

7. Surface: Smooth

8. Back of Tile/Sheet/Nosing: Double-sanded smooth

9. Material Size: ~24 inches by 24 inches (610mm by 610mm) per ASTM F2055 ± 0.018 (± 0.45 mm) is required

11. Squareness: ASTM F2055, ± 0.018 inches (± 0.45 mm) is required

12. Thickness: ~0.12 inches (3mm), ASTM F386 ± 0.005 inches (± 0.127 mm) is required and achieved

14. Dimensional Stability: ASTM F2199, $\leq 0.15\%$ in both directions is required

15. Flammability: ASTM E648; NFPA 253; NBSIR 75 950, 1.03 is achieved, ≥ 0.45 watts/sq. cm for Class 1 is required

16. Smoke Density: ASTM E662; NFPA 258; NBS, 376 (flaming) and 256 (non-flaming) achieved, < 450 is required

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18. CAN/ULC-S102.2: Surface Burning, FSC1 of 125 and SD of 370, achieved
19. Burn Resistance: Resistant to cigarette and solder burns
20. Slip Resistance: ASTM D2047 Static coefficient of friction, Neolite dry 0.99, Neolite wet 0.88 achieved, ≥ 0.5 is required (not recommended for ramps)
21. Bacteria Resistance: ASTM E2180 and ASTM G21, resistant to bacteria, fungi, and micro-organism activity
22. VOC's: flooring to be GREENGUARD Gold Certified for Low VOC Emissions, GREENGUARD Certified for Low VOC Emissions, Blue Angel Certified and CA 01350 Compliant
24. Sound Absorption: ASTM E2179 Δ IIC 14, ISO 140 Δ Lw 10 dB (compare only Δ values)
25. Sound Generation: 67.2 dBA, 68.9 dBC and 20.9 Sones, Independently tested
26. Hardness: ASTM D2240, Shore type "A", 92 achieved, ≥ 85 is required
27. Static Load: ASTM F970, Residual compression of 0.003" with 800 lbs. achieved, ≤ 0.005 " with 250lbs. is required
28. Rolling Load Limit: ≤ 550 lbs. / sq. inch, with no forklift traffic
29. Abrasion Resistance: ASTM D3389, 1.1 lbs. (500g) load on H-18 wheel with 1000 cycles, 0.003 oz. (0.09g) weight loss achieved, ≤ 0.035 oz. (1.0g) is required
30. Elongation: ASTM D412 Modulus @ 10% is 1299 lbs. per sq. inch achieved, ≥ 300 lbs. per sq. inch is required
32. Heat Resistance: ASTM F1514, Avg. $\Delta E \leq 8.0$ is required, easily achieved with all batches and regular maintenance
33. Light Resistance: ASTM F1515, Avg. $\Delta E \leq 8.0$, easily achieved with all batches and regular maintenance
34. Static Generation: AATCC 134, < 2000 Volts at 20% RH, achieved
37. Thermal Transmission: ASTM C518, R-value 0.04, achieved
38. Shine: Higher shine should be achieved by buffing without any artificial topical applied coatings
39. Stain Removal: Samples of the product shall be provided for stain removal testing by the owner. Sample size shall be 24 inches by 24 inches, pre-cleaned by manufacture per published recommendations. Samples shall have no coatings, sealers, floor finish or other manually or mechanically applied finish on the surface of the product. Stain testing shall consist of application of common healthcare related disinfectants and chemicals

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to include, but not limited to, Betadine, Methylene Blue, Silver Nitrate and alcohol based hand sanitizer. Duration of test period shall be no less than one week. Removal of chemicals shall be in accordance with manufacturers published cleaning and maintenance recommendations

- B. Size: Provide maximum size sheet material produced by manufacturer to provide minimum number of joints. Minimum size width acceptable - 1200 mm (48 inches).
- C. Each color and pattern of sheet flooring shall be of same production run.

2.2 WELDING ROD:

- A. Product of floor covering manufacturer in color shall match field color of sheet vinyl covering.

2.3 APPLICATION MATERIALS AND ACCESSORIES

- A. Floor and Base Adhesive: Type recommended by sheet flooring material manufacturer for conditions of use.
- B. Base Accessories:
 - 1. Fillet Strip: 19 mm (3/4 inch) radius fillet strip compatible with resilient sheet material.
 - 2. Cap Strip: Extruded flanged zero edge vinyl reducer strip approximately 25 mm (one inch) exposed height with 13 mm (1/2 inch) flange.

2.4 ADHESIVES

- A. Water resistant type recommended by the sheet flooring manufacturer for the conditions of use. VOC not to exceed 50g/L.

2.5 BASE CAP STRIP AND COVE STRIP

- A. Extruded vinyl compatible with the sheet flooring.
- B. Cap strip "J" shape with feathered edge flange approximately 25 mm (one inch) wide; top designed to receive sheet flooring with 13 mm (1/2 inch) flange lapping top of flooring
- C. Cove strip 70 mm (2-3/4 inch) radius.

2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.

2.7 PRIMER (FOR CONCRETE SUBFLOORS)

- A. As recommended by the adhesive or sheet flooring manufacturer.

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2.8 EDGE STRIPS

- A. Extruded aluminum, mill finish, mechanically cleaned.
- B. 28 mm (1-1/8 inch) wide, 6 mm (1/4 inch) thick, bevel one edge to 3 mm (1/8 inch) thick.
- C. Drill and counter sink edge strips for flat head screws. Space holes near ends and approximately 225 mm (9 inches) on center in between.

2.9 SEALANT

- A. As specified in Section 07 92 00, JOINT SEALANTS.
- B. Compatible with rubber sheet flooring.

PART 3 - EXECUTION**3.1 PROJECT CONDITIONS**

- A. Maintain temperature of sheet flooring above 36 deg C (65 deg F), for 48 hours before installation.
- B. Maintain temperature of rooms where sheet flooring work occurs above 36 deg C (65 deg F), for 48 hours, before installation and during installation.
- C. After installation, maintain temperature at or above 36 deg C 65 deg F.
- D. Building is permanently enclosed.
- E. Wet construction in or near areas to receive sheet flooring is complete, dry and cured.

3.2 SUBFLOOR PREPARATION

- A. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710.
 - 1. Installer shall examine surfaces on which resilient sheet flooring is to be installed, and shall advise Contractor, in writing, of areas which are unacceptable for installation of flooring material. Installer shall advise Contractor which methods are to be used to correct conditions that will impair proper installation. Installation shall not proceed until unsatisfactory conditions have been corrected.
 - 2. Slab substrates dry, free of curing compounds, sealers, hardeners, and other materials which would interfere with bonding of adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by Resilient Floor Covering Institute recommendations in manual RFCI-MRP.
- B. Broom or vacuum clean substrates to be covered by sheet vinyl floor coverings immediately before installation. Following cleaning, examine substrates to determine if there is visually any evidence of moisture,

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alkaline salts, carbonation, or dust.

- C. Primer: If recommended by flooring manufacturer, prior to application of adhesive, apply concrete slab primer in accordance with manufacturer's directions.
- D. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.
- E. Fill cracks, joints, depressions, and other irregularities in concrete with leveling compound.
 - 1. Do not use adhesive for filling or leveling purposes.
 - 2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
 - 3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.
- F. Clean floor of oil, paint, dust and deleterious substances. Leave floor dry and cured free of residue from existing curing or cleaning agents.
- G. Moisture Testing: Perform moisture and pH test as recommended by the flooring and adhesive manufacturers. Perform test locations starting on the deepest part of the concrete structure. Proceed with installation only after concrete substrates meet or exceed the manufacturer's requirements. In the absence of specific guidance from the flooring or adhesive manufacturer the following requirements are to be met:
 - 1. Perform moisture vapor emission tests in accordance with ASTM F1869. Proceed with installation only after substrates have a maximum moisture-vapor-emission rate of 1.36 kg of water/92.9 sq. m (3lb of water/1000 sq. ft.) in 24 hours.
 - 2. Perform concrete internal relative humidity testing using situ probes in accordance with ASTM F2170. Proceed with installation only after concrete reaches maximum 75 percent relative humidity level measurement.
 - 3. A concrete subfloor that meets the requirements of ASTM F710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring is required.
 - 4. A concrete subfloor that is structurally sound, and has finished shrinking, cracking, curling or moving in any way is required.
 - 5. For all concrete substrates on or below grade, a permanent effective vapor retarder with a low permeance (less than 0.1) and that meets the requirements of the latest edition of ASTM E1745 Standard Specification for Water Vapor Retarders Used in
 - 6. Contact with Soil or Granular Fill under Concrete Slabs, should be placed directly underneath the concrete above the granular fill, and installed as per the manufacturer's written instructions. Alternatively a surface applied moisture mitigation system should be used
 - 7. A clean non-burnished concrete surface free from any paint, wax, oil,

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grease, and film forming curing compounds, silicate salts, laitance, mold, mildew, residual adhesive, chemical adhesive removers or anything that may prevent appropriate products bonding to it. If not then the general contractor should provide the mechanical means to remove them. This could be dustless diamond grinding (DiamaBrush), bead-blast or similar with a suitable Hepa vacuum attachment. Review and comply with all relevant local, state and federal regulations

8. Valid tests and acceptable test results should be provided to the end user and flooring contractor, including documenting with photographs, the location of all tests, recorded % relative humidity levels and temperature of both the concrete subfloor and ambient conditions prior to flooring installation. Testing should be performed at the correct, controlled ambient service temperature and humidity following the protocol of ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes, using a Wagner Rapid RH probes only. It is recommended that moisture testing be performed by a certified International Concrete Repair Institute (ICRI) Tier 2 Testing Technician - Grade
9. If it is not possible to drill into the concrete for any reason as detailed in ASTM F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes, please contact the manufacturers Technical Department for other recommendations.
10. Only if it is not possible to provide a concrete substrate with acceptable moisture levels, or that (when appropriate) have a confirmed effective vapor retarder, then a surface applied moisture mitigation system should be used that meets the requirements of ASTM F3010 Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation
11. Systems for Use Under Resilient Floor Coverings. Please note that all additional costs associated with this concrete condition are the responsibility of the general contractor / end user, including any additional requirements for concrete preparation priming, leveler, patching or labor
12. A secure storage area that is maintained permanently or temporarily at ambient service temperature and humidity (except walk in freezers or similar), or 68°F ± 5° F and 50% ± 10% relative humidity, for at least 48 hours prior to and during the application of the flooring, so the flooring contractor can acclimate the flooring materials is required.
13. An installation area that is weather tight and maintained either permanently or temporarily at ambient service temperature and humidity (except walk in freezers or similar), or 68°F ± 5° F and 50% ± 10% relative humidity, for at least 48 hours prior to, during and 72 hours after the application of the flooring is required.
14. Areas with direct prolonged exposure to sunlight should be protected with the use of Low E glass doors and windows or facades.
15. Areas of the flooring that are subject to direct sunlight through doors or windows should have them covered using blinds, curtains, cardboard or similar for the time of the installation and 72 hours after the installation to allow the adhesive to cure. Note: These areas should be installed using wet adhesives only

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16. Prevent all traffic for a minimum of 12 hours and rolling loads for 72 hours to allow the adhesive to cure. If required, after 12 hours protect the flooring from damage during construction operations using Masonite, plywood or a similar product, ensuring first that the flooring surface is free of all debris. Lay panels so that the edges form a butt joint and tape the joint to prevent both movement and debris entrapment underneath them. Inspect immediately before covering and after removal for final acceptance.
 17. Have the flooring cleaned no sooner than 72 hours (unless given written permission) after the installation
- H. Preparation shall include the removal of existing resilient floor and existing adhesive. Do not use solvents to remove adhesives. Coordinate with Asbestos Abatement Section if asbestos abatement procedures will be involved.
- I. Remove existing resilient flooring and adhesive completely in accordance with Resilient Floor Covering Institute recommendations in manual RFCI-WP. Solvents shall not be used.

3.3 INSTALLATION OF FLOORING

- A. Install work in strict compliance with manufacturer's instructions and approved layout drawings.
- B. Maintain uniformity of sheet floor covering direction and avoid cross seams.
- C. Arrange for a minimum number of seams and place them in inconspicuous and low traffic areas, but in no case less than 150 mm (6 inches) away from parallel joints in flooring substrates.
- D. Perform mat bond tests in each major area (1 per ~1,000 sq. ft.) This should consist of the proposed subfloor preparation, mitigation and leveling or smoothing products. Do not proceed with installation until all the results of the bond test are acceptable
- E. Match edges of resilient floor coverings for color shading and pattern at seams.
- F. When required, use a leveler following the manufacturers written instructions. The surface should be free of dust, solvents, paint, wax, varnish, oil, grease, asphalt, old adhesives, and other extraneous materials that may interfere with the bond. These should be completely removed by mechanical means only. Dustless diamond grinding or bead blasting are the preferred method to remove contaminates and bond breakers, as it also helps to level the concrete.
- G. Prime the subfloor prior to using a suitable leveler.
- H. Where resilient sheet flooring abuts other flooring material floors shall finish level.
- I. Extend sheet floor coverings into toe spaces, door reveals, closets, and

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similar openings.

- J. Inform the Contracting Officer's Representative of conflicts between this section and the manufacturer's instructions or recommendations for auxiliary materials, or installation methods, before proceeding.
- K. Install sheet in full coverage adhesives.
 - 1. Air pockets or loose edges will not be accepted.
 - 2. Trim sheet materials to touch in the length of intersection at pipes and vertical projections; seal joints at pipe with waterproof cement or sealant.
- L. Keep joints to a minimum; avoid small filler pieces or strips.
- M. Follow manufacturer's recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.
- N. Follow manufacturer's recommendations regarding pattern match, if applicable.
- O. Installation of Edge Strips:
 - 1. Locate edge strips under center lines of doors unless otherwise indicated.
 - 2. Set aluminum strips in adhesive, anchor with lead anchors and stainless steel Phillips screws.
- P. Integral Cove Base Installation:
 - 1. Set preformed fillet strip to receive base.
 - 2. Install the base with adhesive, terminate expose edge with the cap strip.
 - 3. Form internal and external corners to the geometric shape generated by the cove at either straight or radius corners.
 - 4. Solvent weld joints as specified for the flooring. Seal cap strip to wall with an adhesive type sealant.
 - 5. Unless otherwise specified or shown where sheet flooring is scheduled, provide integral base at intersection of floor and vertical surfaces. Provide sheet flooring and base scheduled for room on floors and walls under and behind areas where casework, laboratory and pharmacy furniture and other equipment occurs, except where mounted in wall recesses.

3.4 INSTALLATION OF INTEGRAL COVED BASE

- A. Set preformed cove to receive base. Install base material with adhesive and terminate exposed edge with cap strip. Integral base shall be **150 mm 6 inches** high.
- B. Internal and external corners shall be formed to geometric shape generated by cove at either square or radius corners.

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3.5 WELDING

- A. Heat weld all joints of flooring and base using equipment and procedures recommended by flooring manufacturer.
- B. Welding shall consist of routing joint, inserting a welding rod into routed space, and terminally fusing into a homogeneous joint.
- C. Upon completion of welding, surface across joint shall finish flush, free from voids, and recessed or raised areas.
- D. Fusion of Material: Joint shall be fused a minimum of 65 percent through thickness of material, and after welding shall meet specified characteristics for flooring.

3.6 CLEANING

- A. Clean small adhesive marks during application of sheet flooring and base before adhesive sets, excessive adhesive smearing will not be accepted.
- B. Remove visible adhesive and other surface blemishes using methods and cleaner recommended by floor covering manufacturers.
- C. Clean and polish materials per flooring manufacturer's written recommendations.
- D. Vacuum floor thoroughly.
- E. Do not wash floor until after period recommended by floor covering manufacturer and then prepare in accordance with manufacturer's recommendations.
- F. Upon completion, Contracting Officer's Representative shall inspect floor and base to ascertain that work was done in accordance with manufacturer's printed instructions.
- G. Perform initial maintenance according to flooring manufacturer's written recommendations.

3.7 PROTECTION:

- A. Protect installed flooring as recommended by flooring manufacturer against damage from rolling loads, other trades, or placement of fixtures and furnishings.
- B. Keep traffic off sheet flooring for 24 hours after installation.
- C. Where construction traffic is anticipated, cover sheet flooring with reinforced kraft paper properly secured and maintained until removal is authorized by the Contracting Officer's Representative.
- D. Where protective materials are removed and immediately prior to acceptance, repair any damage, re-clean sheet flooring, lightly re-apply polish and buff floor.

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3.8 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

- - - E N D - - -

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. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- B. Subfloor Testing and Preparation: Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.
- D. Removal of Existing Construction Containing Asbestos: Section 02 82 11
- E. Color, Pattern and Texture for Resilient Tile Flooring and Accessories: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. 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.
- C. 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.
- D. Shop Drawings:
 - 1. Layout of patterns as shown on the construction documents.
 - 2. Edge strip locations showing types and detail cross sections.
- E. 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.

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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.
- B. 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):
- D2047-11.....Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - D2240-05(R2010).....Test Method for Rubber Property—Durometer Hardness
 - D4078-02(R2008).....Water Emulsion Floor Finish
 - E648-14c.....Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
 - E662-14.....Specific Optical Density of Smoke Generated by Solid Materials
 - E1155/E1155M-14.....Determining Floor Flatness and Floor Levelness Numbers
 - F510/F510M-14.....Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method
 - F710-11.....Preparing Concrete Floors to Receive Resilient Flooring
 - F925-13.....Test Method for Resistance to Chemicals of Resilient Flooring
 - F1066-04(R2014).....Vinyl Composition Floor Tile
 - F1344-12(R2013).....Rubber Floor Tile
 - F1700-13a.....Solid Vinyl Floor Tile
 - F1869-11.....Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - F2170-11.....Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in Situ Probes
 - F2195-13.....Linoleum Floor Tile
- C. Code of Federal Regulation (CFR):

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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.

2.6 LUXURY VINYL TILE:

- A. ASTM F1700, Class III, Printed Film Vinyl Tile
- B. Thickness: 12 mil (1/8 inch)
- C. Size: As specified in Section 09 06 00
- D. Provide products with recycled content with not less than 30 percent.
- E. Chemical Resistance: ASTM F925; pass.

2.7 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.

2.8 PRIMER FOR CONCRETE SUBFLOORS:

- A. Provide in accordance with Section 09 05 16, SUBSURFACE PREPARATION FOR FLOOR FINISHES.

2.9 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.

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2.10 POLISH AND CLEANERS:

- A. Cleaners: As recommended in writing by floor tile manufacturer.
- B. Polish: ASTM D4078.

2.11 MOULDING:

- A. Provide tapered mouldings of vinyl / rubber, anodized aluminum 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.
- C. Perform work regarding removal of flooring and adhesive containing asbestos as specified in Section 02 82 11

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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.

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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 68 00**CARPETING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section specifies carpet, edge strips, adhesives, and other items required for complete installation.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Resilient wall base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

1.3 QUALITY ASSURANCE

- A. Carpet installed by mechanics certified by the Floor Covering Installation Board.
- B. Certify and label the carpet that it has been tested and meets criteria of CRI IAQ Carpet Testing Program for indoor air quality.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. 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.
 - 3. Manufacturer's certificate verifying carpet containing recycled materials include percentage of recycled materials as specified.
- C. Samples:
 - 1. Carpet: "Production Quality" samples 300 x 300 mm (12 x 12 inches) of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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- 2. Floor Edge Strip (Molding): 150 mm (6 inches) long of each color and type specified.
- 3. Base Edge Strip (Molding): 150 mm (6 inches) long of each color specified.
- D. Shop Drawings: Installers layout plan showing seams and cuts for sheet carpet and carpet module.
- E. Maintenance Data: Carpet manufacturer's maintenance instructions describing recommended type of cleaning equipment and material, spotting and cleaning methods and cleaning cycles.

1.5 DELIVERY AND STORAGE

- A. Deliver carpet in manufacturer's original wrappings and packages clearly labeled with manufacturer's name, brand, name, size, dye lot number and related information.
- B. Deliver adhesives in containers clearly labeled with manufacturer's name, brand name, number, installation instructions, safety instructions and flash points.
- C. Store in a clean, dry, well ventilated area, protected from damage and soiling. Maintain storage space at a temperature above 16 degrees C (60 degrees F) for 2 days prior to installation.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Areas in which carpeting is to be installed shall be maintained at a temperature above 16 degrees C (60 degrees F) for 2 days before installation, during installation and for 2 days after installation. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter for the duration of the Contract. Traffic or movement of furniture or equipment in carpeted area shall not be permitted for 24 hours after installation. Other work which would damage the carpet shall be completed prior to installation of carpet.

1.7 WARRANTY

- A. Carpet and installation subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is extended to two years.

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):
 - 1. ANSI/NSF 140-10 Sustainable Carpet Assessment Standard
- C. American Association of Textile Chemists and Colorists (AATCC):
 - 1. AATCC 16-04 Colorfastness to Light

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2. AATCC 129-10 Colorfastness to Ozone in the Atmosphere under High Humidities
 3. AATCC 134-11 Electric Static Propensity of Carpets
 4. AATCC 165-08 Colorfastness to Crocking: Textile Floor Conerings-AATCC Crockmeter Method
- D. American Society for Testing and Materials (ASTM):
1. ASTM D1335-05 Tuft Bind of Pile Yarn Floor Coverings
 2. ASTM D3278-96(R2004) Flash Point of Liquids by Small Scale Closed-Cup Apparatus
 3. ASTM D5116-10 Determinations of Organic Emissions from Indoor Materials/Products
 4. ASTM D5252-05 Operation of the Hexapod Tumble Drum Tester
 5. ASTM D5417-05 Operation of the Vettermann Drum Tester
 6. ASTM E648-10 Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
- E. The Carpet and Rug Institute (CRI):
1. CRI 104-11 Installation of Commercial Carpet

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. Manufacturers standard construction commercial carpet:
 - a. Modular Tile: 660 mm (24 inches) square tile.
 3. Provide static control to permanently control static build up to less than 2.0 kV when tested at 20 percent relative humidity and 21 degrees C (70 degrees F) in accordance with AATCC 134.
 4. Pile Height: Maximum 3.25 mm (0.10 inch).
 5. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).
 6. Pile Type: Level Loop.
 7. Backing materials: Manufacturer's unitary backing designed for glue-down installation using recovered materials.
 8. Appearance Retention Rating (ARR): Carpet shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either the ASTM D 5252 (Hexapod) or ASTM D 5417 (Vettermann) test methods using the number of cycles for short and long term tests as specified.
 9. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or

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- loop free from carpet backing. Test per ASTM D1335.
10. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, class 1 rating only.
 11. Colorfastness to Ozone: Comply with AATCC 129, minimum rating of 4 on the AATCC color transfer chart.
 12. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.
 13. Flammability and Critical Radiant Flux Requirements:
 - a. Test Carpet in accordance with ASTM E 648.
 - b. Class I: Not less than 0.45 watts per square centimeter.
 - c. Class II: Not less than 0.22 watts per square centimeter.
 - d. Carpet in corridors, exits and Medical Facilities: Class I.
 14. Density: 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.
 15. VOC Limits: Use carpet and carpet adhesive that comply with the following limits for VOC content when tested according to ASTM D 5116:
 - a. Carpet, Total VOCs: 0.5 mg/sq.m x hr.
 - b. Carpet, 4-PC (4-Phenylcyclohexene): 0.05 mg/sq.m x hr.
 - c. Carpet, Formaldehyde: 0.05 mg/sq.m x hr.
 - d. Carpet, Styrene: 0.4 mg/sq.m x hr.
 - e. Adhesive, Total VOCs: 10.00 mg/sq.m x hr.
 - f. Adhesive, Formaldehyde: 0.05 mg/sq.m x hr.
 - g. Adhesive, 2-Ethyl-1-Hexanol: 3.00 mg/sq.m x hr.
- B. Shall meet platinum level of ANSI/NSF 140.
- C. Color, Texture, and Pattern: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.2 ADHESIVE AND CONCRETE PRIMER

- A. Waterproof, resistant to cleaning solutions, steam and water, nonflammable, complies with air-quality standards as specified. Adhesives flashpoint minimum 60 degrees C (140 degrees F), complies with ASTM D 3278.

2.3 EDGE STRIPS (MOLDING)

- A. Metal:
1. Hammered surface aluminum, pinless, clamp down type designed for the carpet being installed.
 2. Floor flange not less than 38 mm (1-1/2 inches) wide, face not less than 16 mm (5/8 inch) wide.

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3. Finish: Clear anodic coating unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.

B. Vinyl Edge Strip:

1. 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 Section 09 06 00, SCHEDULE FOR FINISHES.

2.4 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Provide Portland cement bases polymer modifier with latex or polyvinyl acetate resin manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- B. Determine the type of underlayment selected for use by condition to be corrected.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

- A. Examine surfaces on which carpeting is to be installed.
- B. Clean floor of oil, waxy films, paint, dust and deleterious substances that prevent adhesion, leave floor dry and cured, free of residue from curing or cleaning agents[**and existing carpet materials**].
- C. Correct conditions which will impair proper installation, including trowel marks, pits, dents, protrusions, cracks or joints.
- D. Fill cracks, joints depressions, and other irregularities in concrete with leveling compound.
 1. Do not use adhesive for filling or leveling purposes.
 2. Do not use leveling compound to correct imperfections which can be corrected by spot grinding.
 3. Trowel to smooth surface free of trowel marks, pits, dents, protrusions, cracks or joint lines.
- E. Test new concrete subfloor prior to adhesive application for moisture and surface alkalinity per CRI 104 Section 6.3.1 or per ASTM E1907.

3.2 CARPET INSTALLATION

- A. Do not install carpet until work of other trades including painting is complete and dry.
- B. Install in accordance with CRI 104 direct glue down installation.
 1. Relax carpet in accordance with Section 6.4.

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2. Comply with indoor air quality recommendations noted in Section 6.5.
3. Maintain temperature in accordance with Section 15.3.
- C. Secure carpet to subfloor of spaces with adhesive applied as recommended by carpet manufacturer.
- D. Follow carpet manufacturer's recommendations for matching pattern and texture directions.
- E. Cut openings in carpet where required for installing equipment, pipes, outlets, and penetrations.
 1. Bind or seal cut edge of sheet carpet and replace flanges or plates.
 2. Use additional adhesive to secure carpets around pipes and other vertical projections.
- F. Broadloom Carpet:
 1. Install per CRI 104, Section 8.
 2. Lay broadloom carpet lengthwise in longest dimension of space, with minimum seams, uniformly spaced to provide a tight smooth finish, free from movement when subjected to traffic.
 3. Use tape-seaming method to join sheet carpet edges. Do not leave visible seams.
- G. Carpet Modules:
 1. Install per CRI 104, Section 13, Adhesive Application.
 2. Lay carpet modules with pile in same direction unless specified otherwise in Section 09 06 00, SCHEDULE FOR FINISHES.
 3. Install carpet modules so that cleaning methods and solutions do not cause dislocation of modules.
 4. Lay carpet modules uniformly to provide tight flush joints free from movement when subject to traffic.

3.3 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.

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3.4 PROTECTION AND CLEANING

- A. Remove waste, fasteners and other cuttings from carpet floors.
- B. Vacuum carpet and provide suitable protection. Do not use polyethylene film.
- C. Do not permit traffic on carpeted surfaces for at least 48 hours after installation. Protect the carpet in accordance with CRI 104.
- D. Do not move furniture or equipment on unprotected carpeted surfaces.
- E. Just before final acceptance of work, remove protection and vacuum carpet clean.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 09 76 00**RESIN PANELS****PART 1 - GENERAL****1.01 RELATED DOCUMENTS**

1. Drawings and general provisions of the Contract documents apply to this Section.

1.02 INCLUSIONS

1. Solid polymer materials in **vertical** application at the following locations:
 - A. **Application 1: Signage feature** - Behind Reception desk w/ text "PHARMACY" printed on image on panel. Panel to be directly adhered to wall. (Note: Custom Graphic image procurement to be included and coordinated by Resin manufacturer)
 - B. **Application 2: Wall feature** - Custom graphic at end wall in Patient Reception Area. (Note: Custom Graphic image procurement to be included and coordinated by Resin manufacturer)
 - C. **Application 3: Privacy partitions** - 1" Thick privacy panel separations at Reception desk and Ticket printer partition.

1.03 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Color and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.

1.04 SUBMITTALS

1. Samples for Approval
 - a. Submit (qty. 6) 3 inch by 3 inch samples for each material type and color of solid polymer

1.05 QUALITY

1. Acrylic Fire Test Characteristics
 - a. MODEL BUILDING CODES: Class CC-2 (UBC and IBC) for Light Transmitting Plastics
 - b. HORIZONTAL BURN LENGTH: Horizontal burn length from 1.0 to 1.2 in/min for 0.125" material when tested in accordance with ASTM D-635.
 - c. SMOKE DENSITY RATING: Smoke density rating from 4% to 10% for 0.236" material when tested in accordance with ASTM D-2843.
 - d. SELF-IGNITION TEMPERATURE: Self-ignition temperature between 850°F and 910°F when tested in accordance with ASTM D-1929.

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- e. UL 94 FLAMMABILITY CLASSIFICATION: Flammability rating of 94HB.
- f. ASTM E84 25/450 smoke/flame spread.

1.05 HANDLING AND STORAGE

1. Handle materials to prevent damage to finished surfaces and edges
2. Protective paper masking applied to all finished surfaces
3. Keep protective coverings in place following installation through completion of project or until directed to remove protection
4. Do not remove protective backers protecting color layer
5. Allow material to acclimate to ambient room temperature before installation
6. Store materials indoors in a cool, dry, well ventilated area out of direct sunlight and away from heat sources
7. Store material fully supported on edge at a 10° angle from the vertical. Horizontal storage should be done on a flat, sag free surface, clear of dirt and debris
8. Do not allow water to come into direct contact with the material during storage

1.06 WARRANTY

1. Provide manufacturers 1 year warranty against defects in materials and workmanship. Damage caused by improper handling, physical or chemical abuse shall not be covered.
2. Warranty is applicable to Commercial installations provided:
 - a. Materials are maintained in accordance with manufacturers' recommendations and guidelines
 - b. Installation and fabrication by others is done in accordance with manufacturers' recommendations and guidelines

PART 2 - PRODUCTS**2.01 MANUFACTURERS - MATERIALS**

1. Product: Resin panel meeting the requirements listed herein and called out in Section 09 06 00 Schedule for Finishes.
2. Material: Acrylic
 - a. Custom color and translucency as specified by Architect or Designer
 - b. Protective 10ml backer
 - c. Surface finish to be matte with resin coat
 - i. Material shall be fingerprint resistant
 - ii. Material shall be scratch resistant
 - iii. Superficial damage shall be repairable by buffing (see manufacturers' repair recommendations) without damaging overall finish
 - iv. Surface shall be 100% renewable
3. Description:

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- a. **Application 1: Signage feature** - Acrylic Panels with custom graphic print and "PHARMACY" text.
 - i. Opaque 1/4" acrylic panels size and shape as shown on drawings
 - ii. Panels to be cut to size by manufacturer and fabricated my manufacturer as necessary.
 - iii. Panel edges to be CNC edge finish
 - iv. Panel to be directly adhered to wall.
 - v. Fabricate in accordance with manufacturer's recommendations.
 - vi. Note: Custom Graphic image procurement to be included and coordinated by Resin manufacturer)
 - vii. Text to be Helvetica 55 Roman font as per drawings.

- b. **Application 2: Wall feature** - Acrylic Panels near Consult Room in Patient Reception area.
 - i. Opaque 1/4" acrylic panels size and shape as shown on drawings
 - ii. Panels to be cut to size by manufacturer and fabricated my manufacturer as necessary.
 - iii. Panel edges to be CNC edge finish
 - iv. Panel to be directly adhered to wall
 - v. Note: Custom Graphic image procurement to be included and coordinated by Resin manufacturer)

- c. **Application 3: Privacy partitions** - 1" Thick privacy panel separations at Reception desk and Ticket printer partition as detailed in drawings.
 - i. 1" acrylic panels size and shape as shown on drawings
 - ii. Panels to be cut to size by manufacturer and fabricated my manufacturer as necessary.
 - iii. Panel edges to be CNC edge finish
 - iv. Panels to be suspended at the ceiling in a channel with drill thru connection to capture and suspend the panels
 - v. Reception Casework to be notched to accept the panel to provide additional rigidity. Embed panel one inch into the top of the counter and down the vertical face of the reception desk
 - vi. Provide 4-1/2 " , 630 brushed stainless steel base channel at Reception Desk

2.02 MISCELLANEOUS

- 1. Installation method with perimeter channel.
- 2. Provide 7" text as indicated on the drawings in Application 1.
- 3. MAINTENANCE: Follow manufacturers' recommendations and guidelines

PART 3 - INSTALLATION

3.01 INSPECTION

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1. Examine all materials upon receipt for damage and accuracy of component configuration. Alert manufacturer of any irregular conditions immediately upon discovery.
2. Examine all substrates and surfaces that solid polymers will be applied to for compliance with manufacturers' requirements for installation. Confirm that all conditions are satisfactory before proceeding.

3.02 INSTALLATION

1. Comply with manufacturers' written instructions for the installation of solid polymer materials.
2. Matte surface is the front of the solid polymer materials
3. Job site fabrication waste is prohibited as all materials are to be fabricated by manufacturer with all material scrap waste to be recycled. Minor millwork fabrication waste (if any) is to also be recycled.
4. Install components square, level and plumb in accordance with approved shop drawings.
5. Remove all protective masking upon completion of the installation and after such time as the Contractor has designated that all work in the area is substantially complete.
6. Clean surfaces and edges of solid polymer materials per manufacturers' recommendations.

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SECTION 097700

WALL PANEL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. Interior wall panel system application.
- B. Trim and accessories for attaching wall panels, including fastenings, accessory features, connections to the building structure, and other items not mentioned specifically herein, and which are necessary to make a complete installation.
- C. Related Sections:
 - 1. Section 01 33 23: Shop Drawings, Product Data and Samples
 - 2. Section 01 74 19: Construction Waste Management
 - 3. Section 09 06 00: Finishes
 - 4. Section 09 77 50: Solid polymer wall panels.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling: Schedule installation of wall paneling as late in construction schedule as possible to prevent damage during construction.

1.3 SUBMITTALS

- A. Product Data: Furnish manufacturer's literature.
- B. Shop Drawings: Indicate design parameters, adjacent construction, materials, dimensions, thickness, fabrication details, tolerances, colors, finishes, methods of support and anchorages.
- C. Samples: Furnish wall panels and exposed trim and reveals.
- D. Maintenance Instructions: Include manufacturer's recommended cleaning materials and application methods, including precautions in use of cleaning materials that may be detrimental to surfaces.
- E. Qualification of Installer: Submit documentation showing that installer has not less than five years successful experience with system installation and is approved by system manufacturer.

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1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Firm with minimum five years successful experience in plastic laminate wall panel system installation and approved by system manufacturer.
- B. Mock-Up: Provide minimum 10' by 10' mock-up of system for approval prior to beginning installation; approved mock-up may be incorporated into finished installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store panels in clean and dry area where temperatures are maintained at minimum 40 degrees F with normal humidity.
 - 1. Do not store in upright position.
- B. Take precautionary measures with adhesives and solvents to prevent fire hazards.

1.6 PROJECT CONDITIONS

- A. Maintain surfaces and materials at minimum 60 degrees F three days before and during application period.
- B. Provide continuous ventilation during work and after installation of wall covering.
- C. Lay panels flat and store at normal room temperature (after occupancy temperature) for not less than 32 hours before beginning installation to ensure stabilization of panels.

1.7 COORDINATION

- A. Do work of this Section in a fully coordinated and cooperative manner with work of other trades to provide complete and proper installation and to expedite the job without delays.
- B. Secure field measurements before preparation of shop drawings and fabrication where possible, for proper and adequate fabrication and installation of the work.
- C. Priming and back-painting of all carpentry and millwork is specified in Section 09900 - Painting. Do not set items until priming and back-painting have been completed.
- D. Where Interior wall panels are clad around outside corners of a room, the drywall installer should avoid installing drywall corner beads, as this makes shimming the interior wall panels very difficult. (See Section 09260).
- E. Protect all work against damage of any kind until final acceptance of the building. Repair or replace damaged work to the satisfaction of the Architect without additional cost to the Owner.

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- F. Provide adequate ventilation and acclimate panels per Woodwork Institute Manual of Millwork.

1.8 WARRANTY

- A. Wall panel to be warranted against delamination. The factory authorized fabricator, product installer and material manufacturer must sign and date the Warranty documents and submit a copy to the Contractor for the warranty to be valid.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All panel products specified in this section shall be provided by a single manufacturer.

2.2 MATERIALS

- A. Basis of design: (Product Manufacturer?) Colors and surface texture as specified by Section 09 06 00. Panels are to be fabricated as per details.
- B. Thickness: Provide high pressure laminate surface minimum 1/32" thick laminated to 1/4" thick high density fiberboard with thermosetting adhesive and balanced with 1/32" thick high pressure laminate backer. A thickness of 13/8" & 3/4" is approved for interior walls with concealed fasteners, "Z" clip installations.
 - 1. Total Panel Thickness: 5/16".
 - 2. Panel Sizes: As indicated on drawings.
 - 3. Edges: Grooved edges to accept aluminum profiles.
 - 4. Colors: As indicated on Section 09 06 00

2.3 FABRICATION

- A. Interior panels can be sawn, cut, routed and drilled with the usual tools used to fabricate hardwoods (i.e. carbide tipped blades). An experienced fabricator must fabricate material. Field modifications are possible by the installing contractor using hand tools that meet the above requirements.

2.4 SOURCE QUALITY CONTROL

- A. Panels shall be of material specifically designed for wall cladding. Fabricated panels shall comply with all current codes and regulations. Panels shall have uniform thickness (+0.03") and flatness (maximum difference of 0.03") for 10-foot span.

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- B. Flame spread (ASTM E-84): Panels to be UL registered and labeled for quality consistency.
 - a. Class 1 or Class A.
 - b. Class 2 or Class B.
- C. Performance requirements:
 - 1. Modulus of elasticity: 1,500,000-psi minimum.
 - 2. Shear strength: 2000-psi minimum.
 - 3. Compressive strength: 24,000-psi minimum.
 - 4. Weight: 93 lbs. per cubic foot maximum.
 - 5. Tensile strength: 13,000-PSI, minimum.
 - 6. Flexural strength: 16,000-PSI minimum.
 - 7. Surface Impact Resistance: 9 lb.
 - 8. Scratch Resistance: 0.8 lb.
- D. Panel Tolerance:
 - 1. Thickness: 1/32", maximum.
 - 2. Length: 1/4", maximum.
 - 3. Width: 1/4", maximum.
 - 4. Non-porous surface and edges.
- E. Physical Properties:
 - 1. Specific Gravity: 87 lbs. per cubic foot, minimum.
 - 2. Dimensional Stability: 0.03 in/ft, maximum.
 - 3. Water Absorption: 3% by weight, maximum.
 - 4. Vapor Diffusion: 30,000
- F. Optical Properties:
 - 1. Color Stability: Gray scale 4 - 5 according to ISO 105A02-87, (3000 hours Xenon test 1200).
 - 2. SO (2) resistance: Gray scale 4 - 5 (50 cycles 0.0067%).

2.5 SUB-FRAME ASSEMBLY

- A. Aluminum "Z" clips and trim to be manufactured specifically to meet the following requirements:
 - 1. Handle the weight of Interior wall panels.
 - 2. Fasteners for panel assembly to be designed to keep panels consistently flat at each joint.
 - 3. Capable of holding panels up to 6' high x 12' wide.
 - 4. Allow 1/4" ventilation gap between the wall and the back side of the panel clip, to prevent condensation behind the panels.
 - 5. System to allow interchanging of components at a later date, with a dry-fit installation. No liquid adhesives to be used.
- B. Trim and Clip Material
 - 1. Where not seen: Al 6061-T6.
 - 2. Where visible: Al 6063-T5.
 - 3. Thickness: not less than 0.62".
- C. Fasteners to be self-tapping Type F, 8/32" x 3/8" plated steel.
- D. Panel trim for joints, edges and corners to be as shown on the drawings.

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PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install panels and fixing system as per shop drawings and specification.
- B. Install aluminum sub-frame to support the "Z" clip sub-frame assembly.
- C. Maximum fixing distances:
 - a. 2 fixing points in one direction using:
 - i. 8 mm panel is 27".
 - ii. 10 mm panel is 33".
 - b. 3 or more fixing points in one direction:
 - i. 8 mm panel is 31"
 - ii. 10mm panel is 37".
- D. The installation of the panel clip system shall be true and plumb.
- E. Face of the panels are to sit out from the face of the wall $\frac{3}{4}$ " +/- shimming as required.
- F. Installed panels shall have vertical joints with splines routed directly in the center of the panel edge to ensure that all four intersecting panels are kept in the same plane.
- G. Exact sizes and dimensions of the trim to be coordinated with the drawings, field conditions and approved shop drawings.

3.2 PROTECTION

- A. After installation, the General Contractor shall protect the panels from damage. The panels shall be kept free from paint, plaster, cement scratches, or any other destructive forces.

3.3 CLEANING

- A. Panels to be cleaned with standard cleaning solution. Mild solvents may be used to remove stubborn marks and dirt.
- B. Repair or replace all damaged material to the satisfaction of the Architect and/or Contractor.
- C. Installed areas or portions of the work shall be inspected by Architect or General Contractor and approved immediately following completion of such areas.

END OF SECTION

SECTION 097760

SOLID POLYMER WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Provide acrylic resin solid polymer wall panels (SW) with anchorage as required for complete installation.

B. Related Sections:

1. Section 062000: Finish Carpentry

1.2 ADMINISTRATIVE REQUIREMENTS

A. Scheduling: Schedule installation of wall paneling as late in construction schedule as possible to prevent damage during construction.

1.3 SUBMITTALS

A. Product Data: Furnish manufacturer's literature.

B. Shop Drawings: Indicate design parameters, adjacent construction, materials, dimensions, thickness, fabrication details, tolerances, colors, finishes, methods of support and anchorages.

C. Samples: Furnish resin wall panels and exposed anchors.

D. Maintenance Instructions: Include manufacturer's recommended cleaning materials and application methods, including precautions in use of cleaning materials that may be detrimental to surfaces.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store panels in clean and dry area where temperatures are maintained at minimum 40 degrees F with normal humidity.

1. Do not store in upright position.

B. Take precautionary measures with adhesives and solvents to prevent fire hazards.

1.5 PROJECT CONDITIONS

A. Maintain surfaces and materials at minimum 60 degrees F three days before and during application period.

B. Provide continuous ventilation during work and after installation of wall covering.

C. Lay panels flat and store at normal room temperature (after occupancy temperature) for not less than 32 hours before beginning installation to ensure stabilization of panels.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. System Description: Provide acrylic resin solid polymer wall panels with accessories
- B. Regulatory Requirements: Class I (UL Class A), maximum 25 flame spread, 450 smoke generation, ASTM E84.
- C. Solid Surface Wall Panels (SW): Provide solid surface homogeneous solid sheets of filled acrylic resin with ISSFA-2, meeting ANSI Z124.3 and .6, Type Six, and Fed. Spec WW-P-541E/GEN for wall wainscot panel system as indicated.
 - 1. Grade: Premium.
 - 2. Color: See Section 09 06 00
 - 3. Texture: Smooth.
 - 4. Panel Thickness: As indicated on drawings.
 - 5. Superficial damage to depth of 0.010" shall be repairable by sanding and polishing.
- D. Adhesive: Nontoxic type recommended by resin panel manufacturer to suit application and expected service.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Ensure surfaces to receive wall paneling are clean, true and free of irregularities, do not commence with work until surfaces are satisfactory.
- B. Ensure wall surface flatness tolerance does not vary more than 1/8" in 10'-0", nor vary at a rate greater than 1/16" per running foot.

3.2 INSTALLATION

- A. Handle and install resin wall panels in accordance with manufacturer's recommendations and installation instructions.
- B. Secure resin wall panels as indicated.
 - 1. Install panels in maximum size increments available.

3.3 CLEANING

- A. Clean panel system in accordance with manufacturer's instructions.
- B. Remove debris and leave areas neat and clean.

END OF SECTION

SECTION 09 91 00**PAINTING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section specifies field painting.
- B. Section specifies prime coats which may be applied in shop under other sections.
- C. Painting includes shellacs, stains, varnishes, coatings specified, and striping or markers and identity markings.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Shop prime painting of steel and ferrous metals: Division 05 - METALS, Division 08 - OPENINGS, Division 10 - SPECIALTIES, Division 11 - EQUIPMENT, Division 13 - SPECIAL CONSTRUCTION, 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 sections.
- C. Contractor option: Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.
- D. Type of Finish, Color, and Gloss Level of Finish Coat: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Before work is started, or sample panels are prepared, submit manufacturer's literature, 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 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.

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C. Sample Panels:

1. After painters' materials have been approved and before work is started submit sample panels showing each type of finish and color specified.
2. Panels to show color: Composition board, 100 by 250 by 3 mm (4 inch by 10 inch by 1/8 inch).
3. Panel to show transparent finishes: Wood of same species and grain pattern as wood approved for use, 100 by 250 by 3 mm (4 inch by 10 inch face by 1/4 inch) thick minimum, and where both flat and edge grain will be exposed, 250 mm (10 inches) long by sufficient size, 50 by 50 mm (2 by 2 inch) minimum or actual wood member to show complete finish.
4. Attach labels to panel stating the following:
 - a. Federal Specification Number or manufacturers name and product number of paints used.
 - b. Specification code number specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - c. Product type and color.
 - d. Name of project.
5. Strips showing not less than 50 mm (2 inch) wide strips of undercoats and 100 mm (4 inch) wide strip of finish coat.

D. Sample of identity markers if used.

E. 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:

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1. Federal Specification Number, where applicable, and name of material.
 2. Surface upon which material is to be applied.
 3. If paint or other coating, state coat types; prime, body or finish.
- C. Maintain space for storage, and handling of painting materials and equipment in a 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 18 and 30 degrees C (65 and 85 degrees F).

1.5 MOCK-UP PANEL

- A. Before starting application of water paint mixtures, apply paint as specified to an area, not to exceed 9 m² (100 ft²), selected by Contracting Officer's Representative.
- B. Finish and texture approved by Contracting Officer's Representative will be used as a standard of quality for remainder of work.

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 basic designation only.
- B. American Conference of Governmental Industrial Hygienists (ACGIH):
1. ACGIH TLV-BKLT-2008 Threshold Limit Values (TLV) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
 2. ACGIH TLV-DOC-2008 Documentation of Threshold Limit Values and Biological Exposure Indices, (Seventh Edition)
- C. American National Standards Institute (ANSI):
1. A13.1-96 Scheme for the Identification of Piping Systems
- D. American Society for Testing and Materials (ASTM):
1. D260-86 Boiled Linseed Oil
- E. Commercial Item Description (CID):
1. A-A-1555 Water Paint, Powder (Cementitious, White and Colors) (WPC) (cancelled)
 2. A-A-3120 Paint, For Swimming Pools (RF) (cancelled)
- F. Master Painters Institute (MPI):
1. 36-07 Knot Sealer
 2. 45-07 Interior Primer Sealer
 3. 48-07 Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
 4. 101-07 Epoxy Anti-Corrosive Metal Primer

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5. 108-07 High Build Epoxy Coating, Low Gloss (EC)
6. 119-07 Exterior Latex, High Gloss (acrylic) (AE)
7. 134-07 Primer, Galvanized, Water Based
8. 139-07 Interior High Performance Latex, MPI Gloss Level 3 (LL)
9. 141-07 Interior High Performance Latex (SG) MPI Gloss Level 5
10. 143-07 Interior, Institutional Low Odor/VOC, MPI Gloss Level 1
11. 145-07 Interior, Institutional Low Odor/VOC, MPI Gloss Level 3
12. 147-07 Interior, Institutional Low Odor/VOC, MPI Gloss Level 5

G. Steel Structures Painting Council (SSPC):

1. SSPC SP 1-04 (R2004) Solvent Cleaning
2. SSPC SP 2-04 (R2004) Hand Tool Cleaning
3. SSPC SP 3-04 (R2004) Power Tool Cleaning

PART 2 - PRODUCTS**2.1 MATERIALS**

A. Plastic Tape:

1. Pigmented vinyl plastic film in colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES or specified.
2. Pressure sensitive adhesive back.
3. Widths as shown.

B. Identity markers options:

1. Pressure sensitive vinyl markers.
2. Snap-on coil plastic markers.

C. Knot Sealer: MPI 36.

D. Interior Primer Sealer: MPI 45.

E. Epoxy Anti-Corrosive Metal Primer: MPI 101.

F. High Build Epoxy Marine Coating (EC): MPI 108.

G. Exterior Latex, High Gloss (acrylic) (AE): MPI 119.

H. Waterborne Galvanized Primer: MPI 134.

I. Interior High Performance Latex, MPI Gloss Level 3 (LL): MPI 139.

J. Interior High Performance Latex (SG), MPI Gloss Level 5: MPI 141.

K. Interior, Institutional Low Odor/VOC, MPI Gloss Level 1 (LF): MPI 143

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- L. Interior, Institutional Low Odor/VOC, MPI Gloss Level 3 (LL): MPI 145
- M. Interior, Institutional Low Odor/VOC, MPI Gloss Level 5 (SG): MPI 147

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.

2.3 REGULATORY REQUIREMENTS/QUALITY ASSURANCE

- A. Paint materials shall conform to the restrictions of the local Environmental and Toxic Control jurisdiction.
 - 1. Volatile Organic Compounds (VOC): VOC content of paint materials shall not exceed 10g/l for interior latex paints/primers and 50g/l for exterior latex paints and primers.
 - 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. For lead-paint removal, see Section 02 83 33.13, LEAD-BASED PAINT REMOVAL AND DISPOSAL.
 - 3. Asbestos: Materials shall not contain asbestos.
 - 4. Chromate, Cadmium, Mercury, and Silica: Materials shall not contain zinc- chromate, strontium-chromate, Cadmium, mercury or mercury compounds or free crystalline silica.
 - 5. Human Carcinogens: Materials shall 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, where possible.
 - 7. VOC content for solvent-based paints shall not exceed 250g/l and shall not be formulated with more than one percent aromatic hydro carbons by weight.

PART 3 - EXECUTION**3.1 JOB CONDITIONS**

- A. Safety: Observe required safety regulations and manufacturer's warning and

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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 days 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 Contracting Officer and the product manufacturer. Under no circumstances shall application conditions exceed manufacturer recommendations.
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 soon 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 where allowed by manufacturer's printed instructions.
 - b. Dampened with a fine mist of water on hot dry days concrete and masonry surfaces to which water thinned acrylic and cementitious paints are applied 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 SURFACE PREPARATION

A. Method of surface preparation is optional, provided results of finish painting produce solid even color and texture specified with no overlays.

B. General:

1. Remove prefinished items not to be painted such as lighting fixtures, escutcheon plates, hardware, trim, and similar items for reinstallation after paint is dried.
2. Remove items for reinstallation and complete painting of such items and adjacent areas when item or adjacent surface is not accessible or finish is different.
3. See other sections of specifications for specified surface conditions and prime coat.

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4. Clean surfaces for painting 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.

C. Wood:

1. Sand to a smooth even surface and then dust off.
2. Sand surfaces showing raised grain smooth between each coat.
3. Wipe surface with a tack rag prior to applying finish.
4. Surface painted with an opaque finish:
 - a. Coat knots, sap and pitch streaks with MPI 36 (Knot Sealer) before applying paint.
 - b. Apply two coats of MPI 36 (Knot Sealer) over large knots.
5. After application of prime or first coat of stain, fill cracks, nail and screw holes, depressions and similar defects with wood filler paste. Sand the surface to make smooth and finish flush with adjacent surface.
6. Before applying finish coat, reapply wood filler paste if required, and sand surface to remove surface blemishes. Finish flush with adjacent surfaces.
7. Fill open grained wood such as oak, walnut, ash and mahogany with MPI 91 (Wood Filler Paste), colored to match wood color.
 - a. Thin filler in accordance with manufacturer's instructions for application.
 - b. Remove excess filler, wipe as clean as possible, dry, and sand as specified.

D. 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). Exception: where high temperature aluminum paint is used, prepare surface in accordance with paint manufacturer's instructions.
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. This includes 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

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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.

E. **[Zinc-Coated (Galvanized) Metal,][Aluminum,][Copper and Copper Alloys]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.

F. **Masonry, Concrete, Cement Board, Cement Plaster and Stucco:**

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 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 CONCRETE Sections. Remove projections to level of adjacent surface by grinding or similar methods.

G. **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 **[Plaster,][Gypsum (Spackling Compound)]** 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.

3.3 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

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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 component and two 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.

3.4 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 coats; prime, body, and finish. When two 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 Contracting Officer's Representative.
- E. Finish surfaces to show solid even color, free from runs, lumps, brushmarks, laps, holidays, or other defects.
- F. Apply by brush, roller or spray, except as otherwise specified.
- G. Do not spray paint in existing occupied spaces unless approved by Contracting Officer's Representative, except in spaces sealed from existing occupied spaces.
 - 1. Apply painting materials specifically required by manufacturer to be applied by spraying.
 - 2. In areas, 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 WORK NOT PAINTED, motors, controls, telephone, and electrical equipment, fronts of sterilizes and other recessed equipment and similar prefinished items.
- H. 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.

3.5 PRIME PAINTING

- A. After surface preparation prime surfaces before application of body and finish coats, except as otherwise specified.

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- 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 rebates for stop and face glazing of wood, and for face glazing of steel.
- E. Wood and Wood Particleboard:
 - 1. Use same kind of primer specified for exposed face surface.
 - a. Exterior wood: MPI 7 (Exterior Oil Wood Primer) for new construction and MPI 5 (Exterior Alkyd Wood Primer) for repainting bare wood primer except where MPI 90 (Interior Wood Stain, Semi-Transparent (WS) is scheduled.
 - b. Interior wood except for transparent finish: MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat), thinned if recommended by manufacturer.
 - c. Transparent finishes as specified under Transparent Finishes on Wood except Floors[**and Finish for Wood Floors**].
 - 2. Apply two coats of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) to surfaces of wood doors, including top and bottom edges, which are cut for fitting or for other reason.
 - 3. Apply one coat of primer MPI 7 (Exterior Oil Wood Primer) or MPI 5 (Exterior Alkyd Wood Primer) or sealer MPI 45 (Interior Primer Sealer) or MPI 46 (Interior Enamel Undercoat) as soon as delivered to site to surfaces of unfinished woodwork, except concealed surfaces of shop fabricated or assembled millwork and surfaces specified to have varnish, stain or natural finish.
 - 4. Back prime and seal ends of exterior woodwork, and edges of exterior plywood specified to be finished.
 - 5. Apply MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR)) to wood for fire retardant finish.
- F. Metals except boilers, incinerator stacks, and engine exhaust pipes:
 - 1. Steel and iron:[**MPI 79 (Marine Alkyd Metal Primer)**][**MPI 95 (Fast Drying Metal Primer)**][. Use MPI 101 (Cold Curing Epoxy Primer) where][**MPI 77 (Epoxy Cold Cured, Gloss (EC))**][**MPI 98 (High Build Epoxy Coating)**][**MPI 108 (High Build Epoxy Marine Coating (EC))**] 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)**][**MPI 95 (Fast Drying Metal Primer)**].
 - 5. Copper and copper alloys scheduled to be painted: MPI 95 (Fast Drying

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Metal Primer).

6. Machinery not factory finished: MPI 9 (Exterior Alkyd Enamel (EO)).
7. Asphalt coated metal: MPI 1 (Aluminum Paint (AP)).
8. Metal over 94 degrees C. (200 degrees F), Boilers, Incinerator Stacks, and Engine Exhaust Pipes: MPI 22 (High Heat Resistant Coating (HR)).

G. Gypsum Board[and Hardboard]:

1. Surfaces scheduled to have[MPI 10 (Exterior Latex, Flat (AE))][MPI 11 (Exterior Latex, Latex, Semi-Gloss (AE))][MPI 119 (Exterior Latex, High Gloss (acrylic) (AE))][or][MPI 53 (Interior Latex, Flat)][, MPI (Gloss Level 1 LE)][MPI 52 (Interior Latex, MPI Gloss Level 3 (LE))][MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE))][MPI 114 (Interior Latex, Gloss (LE) and (LG) finish: Use][MPI 10 (Exterior Latex, Flat (AE))][MPI 11 (Exterior Latex, Semi-Gloss (AE))][MPI 119 (Exterior Latex, High Gloss (acrylic)(AE) or][MPI 53 (Interior Latex, MPI Gloss Level 3 (LE))][MPI 52 (Interior Latex, MPI Gloss Level 3 (LE))][MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE))][MPI 114 (Interior Latex, Gloss (LE) and (LG) respectively].
 - a. Primer: MPI 50 (Interior Latex Primer Sealer) except use MPI 45 (Interior Primer Sealer)[MPI 46 (Interior Enamel Undercoat)] in shower and bathrooms.
2. Surfaces scheduled to receive vinyl coated fabric wallcovering: Use MPI 45 (Interior Primer Sealer)[MPI 46 (Interior Enamel Undercoat)].
 - a. Use MPI 101 (Cold Curing Epoxy Primer) for surfaces scheduled to receive[MPI 77 (Epoxy Cold Cured, Gloss (EC))][MPI 98 (High Build Epoxy Coating)][MPI 108 (High Build Epoxy Marine Coating (EC)) finish.

- H. Concrete Floors:[MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss)][MPI 60 (Interior/ Exterior Latex Porch & Floor Paint, Low Gloss)].

3.6 EXTERIOR FINISHES

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Steel and Ferrous Metal,[Including Tern]:
 - a. Two coats of MPI 8 (Exterior Alkyd, Flat (EO))[MPI 9 (Exterior Alkyd Enamel (EO)) MPI 94 (Exterior Alkyd, Semi-Gloss (EO)) on exposed surfaces, except on surfaces over 94 degrees C (200 degrees F).
 - b. One coat of MPI 22 (High Heat Resistant Coating (HR)) on surfaces over 94 degrees K (200 degrees F) and on surfaces of boiler[incinerator][stacks] engine exhaust pipes.

3.7 INTERIOR FINISHES

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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B. Metal Work:

1. Apply to exposed surfaces.
2. Omit body and finish coats on surfaces concealed after installation except electrical conduit containing conductors over 600 volts.
3. Ferrous Metal, Galvanized Metal, and Other Metals Scheduled:
 - a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK) unless specified otherwise.
 - b. Two coats of[**MPI 48 (Interior Alkyd Gloss (AK))**][**MPI 51 (Interior Alkyd, Eggshell (AK0))**].
 - c. One coat of MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) on exposed interior surfaces of alkyd-amine enamel prime finished windows.
 - d. Two coats of CID-A-A3120 Type E (RP) on exposed surfaces in[**battery rooms**][**pool area**][**chlorinator rooms**].
 - e. Machinery: One coat MPI 9 (Exterior Alkyd Enamel (EO)).
 - f. Asphalt Coated Metal: One coat MPI 1 (Aluminum Paint (AP)).
 - g. Ferrous Metal over 94 degrees K (200 degrees F): Boilers, Incinerator Stacks, and Engine Exhaust Pipes: One coat MPI 22 (High Heat Resistant Coating (HR)).

C. Gypsum Board:

1. One coat of[**MPI 45 (Interior Primer Sealer)**][**MPI 46 (Interior Enamel Undercoat)**] plus one coat of MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL)).
2. Two coats of MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF)).
3. One coat of[**MPI 45 (Interior Primer Sealer)**][**MPI 46 (Interior Enamel Undercoat)**] plus one coat of MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE) or MPI 114 (Interior Latex, Gloss (LE) and (LG)).
4. One coat of[**MPI 45 (Interior Primer Sealer)**][**MPI 46 (Interior Enamel Undercoat)**] plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).

D. Masonry and Concrete Walls:

1. Over MPI 4 (Interior/Exterior Latex Block Filler) on CMU surfaces.
2. Two coats of[**MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE))**][**MPI 52 (Interior Latex, MPI Gloss Level 3 (LE))**][**MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE))**][**MPI 114 (Interior Latex, Gloss (LE) and (LG))**].
3. Two coats of[**MPI 138 (Interior High Performance Latex, MPI Gloss Level 2 (LF))**][**MPI 139 (Interior High Performance Latex, MPI Gloss level 3 (LL))**][**MPI 140 (Interior High Performance Latex MPI Gloss level 4))**][**MPI 141 (Interior High Performance Latex (SG)) MPI Gloss level 5)**][**MPI 114 (Interior Latex, Gloss (LE) and (LG))**].

E. Wood:

1. Sanding:
 - a. Use 220-grit sandpaper.

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- b. Sand sealers and varnish between coats.
 - c. Sand enough to scarify surface to assure good adhesion of subsequent coats, to level roughly applied sealer and varnish, and to knock off "whiskers" of any raised grain as well as dust particles.
2. Sealers:
- a. Apply sealers specified except sealer may be omitted where pigmented, penetrating, or wiping stains containing resins are used.
 - b. Allow manufacturer's recommended drying time before sanding, but not less than 24 hours or 36 hours in damp or muggy weather.
 - c. Sand as specified.
3. Paint Finish:
- a. One coat of[**MPI 45 (Interior Primer Sealer)**][**MPI 46 (Interior Enamel Undercoat)**] plus one coat of MPI 47 (Interior Alkyd, Semi-Gloss (AK) (SG)).
 - b. One coat[**MPI 66 (Interior Alkyd Fire retardant, Clear Top-Coat (ULC Approved) (FC)**][**MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR))**, intumescent type (FR), on exposed wood][in attics with floors used for mechanical equipment][and above ceilings where shown].
 - c. One coat of[**MPI 45 Interior Primer Sealer)**] MPI 46 (Interior Enamel Undercoat) plus one coat of MPI 48 (Interior Alkyd Gloss (AK)).
 - d. Two coats of MPI 51 (Interior Alkyd, Eggshell (AK)).
4. Transparent Finishes on Wood Except Floors.
- a. Natural Finish:
 - 1) One coat of sealer as written in 2.1 E.
 - 2) Two coats of MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV))[**MPI 31 (Polyurethane, Moisture Cured, Clear Gloss (PV))**].
 - b. Stain Finish:
 - 1) One coat of MPI 90 (Interior Wood Stain, Semi-Transparent (WS)).
 - 2) Use wood stain of type and color required to achieve finish specified. Do not use varnish type stains.
 - 3) One coat of sealer as written in 2.1 E.
 - 4) Two coats of[**MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV))**][**MPI 31 (Polyurethane Moisture Cured, Clear Gloss (PV))**].
 - c. Varnish Finish:
 - 1) One coat of sealer as written in 2.1 E.
 - 2) Two coats of[**MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV0))**] MPI 31 (Polyurethane Moisture Cured, Clear Gloss (PV)).
 - d. MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat(ULC Approved) (FC) Intumescent Type, Fire Retardant Coating (FC) where scheduled: Two coats.

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5. Finish for Wood Floors:
 - a. Hardwood Flooring:
 - 1) Apply MPI 91 (Wood Filler Paste) to open grained wood. Remove surplus filler and wipe clean.
 - 2) Sand lightly when dry. Remove dust.
 - 3) Apply two coats of CID-A-A-2335 (Sealer, Surface).
 - 4) Apply two thin coats of P-W-155 (Wax Floor, Water Emulsion) and machine buff to uniform luster.
 - b. Stage Floor: Sand only. No filling, sealing, or waxing is required.
 - c. Exercise Area[**Recreation Hall**][**Gymnasium**][**Handball Boards in Exercise Area**] Floor Finish:
 - 1) Two coats of CID-A-A-2335 (Sealer, Surface).
 - 2) Two coats of coating as written in 2.1 D (PL). Coating applied evenly in direction of boards and free from streaks.
 - 3) Allow 48 hours between coats.
 - 4) Apply in one continuous operation with squeegee or lambs wool applicator with application free from streaks in accordance with plastic coating manufacturer's directions.
 - d. Striping:
 - 1) Where striping is shown for wood floors apply plastic tape stripes as written 2.1 F.
 - 2) Do striping when floor coating is dry.
 - 3) Install stripes to straight lines and true curves as shown.
- F. Concrete Floors: One coat of MPI 68 (Interior/ Exterior Latex Porch & Floor Paint, Gloss (FE)).
- G. Miscellaneous:
 1. Apply where specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 2. MPI 1 (Aluminum Paint): Two coats of aluminum paint.
 3. Gold Paint (GP): Two coats of gold paint.
 4. 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 coat of[**MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE))**][**MPI 52 (Interior Latex, MPI Gloss Level 3 (LE))**][**MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE))**][**MPI 114 (Interior Latex, Gloss and (LG))**].
 - c. Units of organic fiber or other material not having a class A rating: One coat of[**MPI 66 (Interior Alkyd Fire Retardant, Clear Top-Coat (ULC Approved) (FC))**][**MPI 67 (Interior Latex Fire Retardant, Top-Coat (ULC Approved) (FR))**] fire retardant paint.
 5. Interstitial floor markings: One coat[**MPI 27 (Exterior/ Interior Alkyd Floor Enamel, Gloss (FE))**][**MPI 59 (Interior/ Exterior Alkyd Porch & Floor Enamel, Low Gloss (FE))**][**MPI 68 (Interior/ Exterior**

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Latex Porch & Floor Paint, Gloss)][MPI 60 (interior/ Exterior Latex Porch & Floor Paint, Low Gloss (FR))].

3.8 REFINISHING EXISTING PAINTED SURFACES

- A. Clean, patch and repair existing surfaces as specified under surface preparation.
- B. Remove and reinstall items as specified under surface preparation.
- 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 coat of[**MPI 31 (Polyurethane, Moisture Cured, Clear Gloss)][MPI 71 (Polyurethane, Moisture Cured, Clear Flat (PV))].**
- 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.

3.9 PAINT COLOR

- A. Color and gloss of finish coats is specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- 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:

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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.

3.10 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 Section 09 06 00, SCHEDULE FOR FINISHES paint as specified under paragraph H, colors.
- 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 paragraph, Building and Structural WORK NOT PAINTED.
- H. Color:
 1. Paint items having no color specified in Section 09 06 00, SCHEDULE FOR FINISHES to match surrounding surfaces.
 2. Paint colors as specified in Section 09 06 00, SCHEDULE FOR FINISHES 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

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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.

I. Apply paint systems on properly prepared and primed surface as follows:

1. Exterior Locations:

- a. Apply two coats of[**MPI 8 (Exterior Alkyd, Flat (EO))**][**MPI 94 (Exterior Alkyd, Semi-gloss (EO))**][**MPI 9 (Exterior Alkyd Enamel (EO))**] to the following ferrous metal items: Vent and exhaust pipes with temperatures under 94 degrees C (200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.
- b. Apply two coats of[**MPI 10 (Exterior Latex, Flat (AE))**][**MPI 11 (Exterior Latex, Semi Gloss (AE))**] MPI 119 (Exterior Latex, High Gloss (acrylic) (AE)) to the following metal items: Galvanized and zinc-copper alloy metal.
- c. Apply one coat of MPI 22 (High Heat Resistant Coating (HR)), 650 degrees C (1200 degrees F) to incinerator stacks, boiler stacks, and engine generator exhaust.

2. Interior Locations:

- a. Apply two coats of MPI 47 (Interior Alkyd, Semi-Gloss (AK)) to following items:
 - 1) Metal under 94 degrees C (200 degrees F) of items such as bare piping, fittings, hangers and supports.
 - 2) Equipment and systems such as hinged covers and frames for control cabinets and boxes, cast-iron radiators, electric conduits and panel boards.
 - 3) Heating, ventilating, air conditioning, plumbing equipment, and machinery having shop prime coat and not factory finished.
- b. Ferrous metal exposed in hydrotherapy equipment room and chlorinator room of water and sewerage treatment plants: One coat of MPI 101 (Cold Curing Epoxy Primer) and one coat of[**MPI 77 (Epoxy Cold Cured, Gloss (EC))**][**MPI 98 (High Build Epoxy Coating)**][**MPI 108 (High Build Epoxy Marine coating (EC))**].
- c. Apply one coat of MPI 50 (Interior Latex Primer Sealer) and one coat of[**MPI 53 (Interior Latex, Flat, MPI Gloss Level 1 (LE))**][**MPI 44 (Interior Low Sheen Latex)**][**MPI 52 (Interior Latex, MPI Gloss Level 3 (LE))**][**MPI 43 (Interior Satin Latex)**][**MPI 54 (Interior Latex, Semi-Gloss, MPI Gloss Level 5 (LE))**][**MPI 114 (Interior Latex, Gloss (LE) and (LG))**] on finish of insulation on boiler breeching and uptakes inside boiler house, drums, drumheads, oil heaters, feed water heaters, tanks and piping.
- d. Apply two coats of MPI 22 (High Heat Resistant Coating (HR)) to ferrous metal surface over 94 degrees K (200 degrees F) of following items:
 - 1) Garbage and trash incinerator.

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- 2) Medical waste incinerator.
 - 3) Exterior of boilers and ferrous metal in connection with boiler settings including supporting members, doors and door frames and fuel oil burning equipment.
 - 4) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (200 degrees F).
 - 5) Engine generator exhaust piping and muffler.
 - e. Paint electrical conduits containing cables rated 600 volts or more using two coats of[**MPI 9 (Exterior Alkyd Enamel (EO))**][**MPI 8(Exterior Alkyd, Flat (EO))**][**MPI 94 (Exterior Alkyd, Semi-gloss (EO))**] in the Federal Safety Orange color in exposed and concealed spaces full length of conduit.
3. Other exposed locations:
- a. Metal surfaces, except aluminum, of cooling towers exposed to view, including connected pipes, rails, and ladders: Two coats of MPI 1 (Aluminum Paint (AP)).
 - b. Cloth jackets of insulation of ducts and pipes in connection with plumbing, air conditioning, ventilating refrigeration and heating systems: One coat of MPI 50 (Interior Latex Primer Sealer) and one coat of[**MPI 10 (Exterior Latex, Flat)**][**MPI 11 (Exterior Latex Semi-Gloss (AE))**][**MPI 119 (Exterior Latex, High Gloss (acrylic)(AE))**].

3.11 BUILDING AND STRUCTURAL WORK FIELD PAINTING

- A. Painting and finishing of interior and exterior work except as specified under paragraph 3.11 B.
1. Painting and finishing of new[**and existing**] work including colors and gloss of finish selected is specified in Finish Schedule, Section 09 06 00, SCHEDULE FOR FINISHES.
 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.

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- 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., Inchcape Testing Services, Inc., 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. Gaskets.
- 8. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundation walls and interior walls in pipe basements.
- 9. Face brick.
- 10. Structural steel encased in concrete, masonry, or other enclosure.
- 11. Structural steel to receive sprayed-on fire proofing.
- 12. Ceilings, walls, columns in interstitial spaces.
- 13. Ceilings, walls, and columns in pipe basements.
- 14. Wood Shingles.

3.12 IDENTITY PAINTING SCHEDULE

- A. Identify designated service in accordance with ANSI A13.1, unless specified otherwise, on exposed piping, piping above removable ceilings, piping in accessible pipe spaces, interstitial spaces, and piping behind access panels.
 - 1. Legend may be identified using 2.1 G options or by 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 12000 mm (40 feet) apart on straight runs of piping. Identification next

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to plumbing fixtures is not required.

3. Locate Legends clearly visible from operating position.
4. Use arrow to indicate direction of flow.
5. Identify pipe contents with sufficient additional details such as temperature, pressure, and contents to identify possible hazard. Insert working pressure shown on drawings 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 BACK- GROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Blow-off		Yellow	Black	Blow-off
Boiler Feedwater		Yellow	Black	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		Yellow	Black	Shop Air
Air-Instrument Controls		Green	White	Air-Inst Cont
Drain Line		Green	White	Drain
Emergency Shower		Green	White	Emg Shower
High Pressure Steam		Yellow	Black	H.P. _____*
High Pressure Condensate Return		Yellow	Black	H.P. Ret _____*
Medium Pressure Steam		Yellow	Black	M. P. Stm _____*
Medium Pressure Condensate Return		Yellow	Black	M.P. Ret _____*
Low Pressure Steam		Yellow	Black	L.P. Stm _____*
Low Pressure Condensate Return		Yellow	Black	L.P. Ret _____*
High Temperature Water Supply		Yellow	Black	H. Temp Wtr Sup
High Temperature Water Return		Yellow	Black	H. Temp Wtr Ret
Hot Water Heating Supply		Yellow	Black	H. W. Htg Sup
Hot Water Heating Return		Yellow	Black	H. W. Htg Ret
Gravity Condensate Return		Yellow	Black	Gravity Cond Ret
Pumped Condensate Return		Yellow	Black	Pumped Cond Ret
Vacuum Condensate Return		Yellow	Black	Vac Cond Ret
Fuel Oil - Grade		Green	White	Fuel Oil-Grade ____*
Boiler Water Sampling		Yellow	Black	Sample
Chemical Feed		Yellow	Black	Chem Feed
Continuous Blow-Down		Yellow	Black	Cont. B D
Pumped Condensate			Black	Pump Cond
Pump Recirculating		Yellow	Black	Pump-Recirc.
Vent Line		Yellow	Black	Vent
Alkali		Yellow		Black Alk
Bleach		Yellow	Black	Bleach
Detergent		Yellow	Black	Det

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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		Yellow	Black	Acid Waste
Vent		Yellow	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	White	Auto Spr
Standpipe		Red	White	Stand
Sprinkler		Red	White	Drain
Hot Water Supply Domestic/Solar Water			H.W. Sup Dom/SW	
Hot Water Return Domestic/Solar Water			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 6100 mm (20 foot) intervals in between. Use labels with yellow background with black border and words Danger High Voltage Class, [5000][15000][25000].
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: Section 22 61 13.74, DENTAL COMPRESSED-AIR PIPING / Section 22 61 19.74, DENTAL COMPRESSED-AIR EQUIPMENT.
 - c. Laboratory gas and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
 - d. Oral evacuation lines: Section 22 62 19.74, DENTAL VACUUM AND EVACUATION EQUIPMENT.
 - e. Medical Gases and vacuum lines: Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES / Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
 - f. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27

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05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section
28 05 33, RACEWAYS AND BOXES 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 6100 mm (20 feet) on center on corridor sides of partitions, and with a least one message per room on room side of partition.
4. Use semigloss 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 shown.
2. Paint numbers and letters 100 mm (4 inches) high, locate 450 mm (18 inches) below overhead structural slab.
3. Apply on four 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.

3.13 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.

3.14 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

- - - E N D - - -

APPENDIX

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Paint or coating	Abbreviation
Acrylic Emulsion	AE (MPI 10 - flat/MPI 11 - semigloss/MPI 119 - gloss)
Alkyd Flat	Ak (MPI 49)
Alkyd Gloss Enamel	G (MPI 48)
Alkyd Semigloss Enamel	SG (MPI 47)
Aluminum Paint	AP (MPI 1)
Cementitious Paint	CEP (TT-P-1411)
Exterior Latex	EL??(MPI 10 / 11 / 119)??
Exterior Oil	EO (MPI 9 - gloss/MPI 8 - flat/MPI 94 - semigloss)
Epoxy Coating	EC (MPI 77 - walls, floors/MPI 108 - CMU, concrete)
Fire Retardant Paint	FR (MPI 67)
Fire Retardant Coating (Clear)	FC (MPI 66, intumescent type)
Floor Enamel	FE (MPI 27 - gloss/MPI 59 - eggshell)
Heat Resistant Paint	HR (MPI 22)
Latex Emulsion	LE (MPI 53, flat/MPI 52, eggshell/MPI 54, semigloss/MPI 114, gloss Level 6)
Latex Flat	LF (MPI 138)
Latex Gloss	LG (MPI 114)
Latex Semigloss	SG (MPI 141)
Latex Low Luster	LL (MPI 139)
Plastic Floor Coating	PL
Polyurethane Varnish	PV (MPI 31 - gloss/MPI 71 - flat)
Rubber Paint	RF (CID-A-A-3120 - Paint for Swimming Pools (RF)).
Water Paint, Cement	WPC (CID-A-A-1555 - Water Paint, Powder).
Wood Stain	WS (MPI 90)
Verify abbreviations used in the following coating sections:	
Section 09 96 59, HIGH-BUILD GLAZED COATINGS	GC
Section 09 94 19, MULTICOLOR INTERIOR FINISHING	MC

- - - E N D - - -

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SECTION 10 11 23**TACKBOARDS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies tackboards (bulletin boards), tack wall panels and related items.
- B. Boards may be factory or field assembled.
- C. Where shown, assemble both markerboards and tackboards into a single unit.

1.2 RELATED WORK

- A. Color of tackboard: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY ASSURANCE

- A. Boards to be the products of one manufacturer.

1.4 SUSTAINABILITY REQUIREMENTS

- A. Biobased Material: For products designated by the USDA's BioPreferred® program, provide products that meet or exceed USDA recommendations for biobased content, subject to the products compliance with performance requirements in this Section. For more information regarding the product categories covered by the BioPreferred® program, visit <http://www.biopreferred.gov>.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Shop Drawings: Identifying all parts by name and material and showing design, construction, installation, anchorage and relation to adjacent construction.
- C. Manufacturer's Literature and Data:
 - 1. Bulletin board.
- D. Samples:

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1. Tackboard, 300 by 300 mm (six by six inches), each color, mounted on backing.
2. Integrally colored anodized aluminum, 300 mm (six inch) length.
3. Cork filled map rail, 300 mm (six inch) length.
4. Each accessory (after approval, may be used in the work).

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. American National Standards Institute (ANSI):

A208.1-09	Particleboard
A135.4-04	Basic Hardboard
- C. American Society for Testing and Materials (ASTM):

B221/B221M-08	Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
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- D. National Association of Architectural Metal Manufacturers (NAAMM):

AMP 500 Series	Metal Finishes Manual
AMP 501	Finishes for Aluminum

PART 2 - PRODUCTS**2.1 BULLETIN BOARD**

- A. Bulletin board consists of a tackboard, snap on aluminum frame, grounds and other items specified and shown.

2.2 FABRICATION

- A. Materials:
 1. Aluminum, extruded: ASTM B221.
 2. Cork: Plastic-impregnated cork, mildew resistant, on core panel indicated.
 5. Backing: Hardboard, ANSI A135.4 or particleboard, ANSI A208.1.
 6. Tack Wall Substrate: Mineral or wood fiber product manufactured for this purpose; minimum density 544 Kg/cu.m (34 pcf) and Class A surface burning characteristics.
- B. Components:

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1. Tackboard: Cork face, 6 mm (1/4-inch) thick factory laminated to a hardboard or particleboard backing of thickness required so that the face of the cork will be in the same plane as the face of the surface indicated on drawings
 2. Tackwall: Cork face, 6 mm (1/4 inch) laminated to specified substrate of 12 mm (1/2 inch) thickness.//
 3. Frames (Trim): Extruded aluminum, 1.5 mm (0.060-inch) thick, snap-on type, approximate face width 44 mm (1-3/4 inch), depth and configuration as required to return to wall and engage clips.
 4. Display Rail: Snap-on type, same materials as frames, approximate face width one inch with 6 mm (1/4-inch) thick cork insert.
 5. Mullions: Snap-on type, same material and face width as frames, designed to finish flush with frame.
 6. Grounds: Continuous zinc-coated (galvanized) steel or extruded aluminum members designed to support the tackboard and clips for snap-on frames, and map rail.
 7. Clips: Manufacturer's standard as required to support frame, mullions, and display rail.
- C. Provide bulletin boards 3660 mm (12 feet) or less in length as one piece. Larger units to have one joint at center. Provide metal spline in joints, with faces in same plane and edges touching along entire length.
- D. Finish exposed aluminum surfaces as follows:
1. AA 45 chemically etched medium matte, with clear anodic coating Class II Architectural, 0.4 mils thick (AA-M12C22A32).
 2. AA 45 chemically etched medium matte, with integrally colored anodic coating, Class II Architectural, 0.4 mils thick (AA-M12C22A32, of color to match approved sample).

PART 3 - EXECUTION**3.1 INSTALLATION, GENERAL**

- A. Install units in accordance with the manufacturer's installation instructions, use concealed fasteners.
- B. Inspect surfaces and related construction to receive units. Verify partitions have reinforcing to receive fasteners. Verify type and placement of reinforcement.

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C. Do not proceed with the installation until reinforcement is in place and surfaces are flat.

D. Assemble units as specified by the manufacturer.

3.2 INSTALLATION OF BULLETIN BOARDS

1. Mount bulletin boards with adhesive and blocking pads spaced 16 inches on center each way.
2. Grounds designed to receive clips for snap-on trim to be continuous and be secured 300 mm (12 inches) on center. Space clips 300 mm (12 inches) on center.
3. Miter trim at corners, conceal fasteners. Modify trim as required to conform to surrounding construction details.

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SECTION 10 26 00**WALL AND DOOR PROTECTION****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies handrail/wall guard combinations, corner guards and door/door frame protectors and high impact wall covering.

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Structural steel corner guards: Section 05 50 00, METAL FABRICATIONS.
- C. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- D. Color and texture of aluminum and resilient material: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Show design and installation details.
- C. Manufacturer's Literature and Data:
 - 1. Handrail/Wall Guard Combinations.
 - 2. Wall Guards.
 - 3. Corner Guards.
 - 4. Door/Door Frame Protectors.
- D. Test Report: Showing that resilient material complies with specified fire and safety code requirements.

1.4 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° C (70 degrees F) for at least 48 hours prior to installation.

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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 Society for Testing and Materials (ASTM):
 - 1. A167-99(R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 2. B221-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - 3. D256-06 Impact Resistance of Plastics
 - 4. D635-06 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
 - 5. E84-09 Surface Burning Characteristics of Building Materials
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. AMP 500-06 Metal Finishes Manual
- D. National Fire Protection Association (NFPA):
 - 1. 80-10 Standard for Fire Doors and Windows
- E. Society of American Automotive Engineers (SAE):
 - 1. J 1545-05 Instrumental Color Difference Measurement for Exterior Finishes.
- F. Underwriters Laboratories Inc. (UL):
 - 1. Annual Issue Building Materials Directory

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Aluminum Extruded: ASTM B221, Alloy 6063, Temper T5 or T6.
- B. Resilient Material:
 - 1. Extruded and injection molded acrylic vinyl or extruded polyvinyl chloride meeting following requirements:
 - a. Minimum impact resistance of 1197 ps (25 ft lbs per sq.ft) when tested in accordance with ASTM D256 (Izod impact, ft.lbs. per inch notch).
 - 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. Material shall be labeled and tested by Underwriters Laboratories or other approved independent testing laboratory.

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- e. Integral color with all colored components matched in accordance with SAE J 1545 to within plus or minus 1.0 on the CIE-LCH scales.
- f. Same finish on exposed surfaces.

2.2 CORNER GUARDS

- A. Resilient, Shock-Absorbing Corner Guards:[Flush mounted][Surface mounted] type of[30 mm (1-1/4 inch) radius)][6 mm (1/4-inch corner)] formed to profile shown.
 - 1. Snap-on corner guard formed from resilient material, minimum 2 mm (0.078-inch) thick, free floating on a continuous 1.6 mm (0.063-inch) thick extruded aluminum retainer.[Design 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. Provide factory fabricated end closure caps at top and bottom of surface mounted corner guards.
 - 3. Flush mounted corner guards installed on any fire rated wall shall maintain 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, the insulating materials shall be provided by the manufacturer of the corner guard system.
 - b. All exposed metal in fire rated assemblies shall have a paintable finish.

2.3 WALL GUARDS AND HANDRAILS

- A. Resilient Wall Guards and Handrails:
 - 1. Handrail/Wall Guard Combination: Snap-on covers of resilient material, minimum 2 mm (0.078-inch) thick, shall be free-floated on a continuous, extruded aluminum retainer, minimum 1.8 mm (0.072-inch) thick, anchored to wall at maximum 760 mm (30 inches) on center.
 - 2. Wall Guards (Crash Rails): Snap-on covers of resilient material, minimum 2.8 mm (0.110-inch) thick, shall be free-floated over 50 mm (two-inch) wide aluminum retainer clips, minimum 2.3 mm (0.090-inch) thick, anchored to wall at maximum 600 mm (24 inches) on center, supporting a continuous aluminum retainer, minimum 1.6 mm (0.062-inch) thick; or, shall be free-floated over a continuous extruded aluminum retainer, minimum 2.3 (0.090-inch) thick anchored to wall at maximum 600 mm (24 inches) on center.
 - 3. Provide handrails and wall guards (crash rails) with prefabricated and closure caps, inside and outside corners, concealed splices, cushions, mounting hardware and other accessories as required. End caps and corners shall be field adjustable to assure close alignment with handrails and wall guards (crash rails). Screw or bolt closure caps to aluminum retainer.

2.4 DOOR AND DOOR FRAME PROTECTION

- A. Fabricate door and door frame protection items from vinyl acrylic or

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polyvinyl chloride resilient material, minimum 1.5 mm (0.060-inch) thick, for doors, as shown.

- B. Coordinate door and door frame protection material requirements with door and frame suppliers to insure fit for all components, and color as specified. As indicated on the drawings.
- C. Provide adhesive as recommended by resilient material manufacturer.

2.5 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, submit shop drawings showing proposed installation details.

2.6 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Resilient Material: Embossed texture and color in accordance with SAE J 1545 and as specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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.
- B. Where corner guards are installed on walls, partitions or columns finished with plaster or ceramic tile, anchor corner guards as shown on drawings. Provide continuous 16 gage perforated, galvanized Z-shape steel anchors welded to back edges of corner guards and wired to metal studs. Coat back surfaces of corner guards, where shown, with a non-flammable, sound deadening material. Corner guards shall overlap finish plaster surfaces.
 - 1. 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 drawings. Grout spaces solid between guards and backing with Portland cement and sand mortar.
 - 2. 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 to cure undisturbed for 24 hours.

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3.3 RESILIENT HANDRAIL, WALL GUARD COMBINATIONS,

- A. Secure guards to walls with brackets and fasteners in accordance with manufacturer's details and instructions.

3.4 ALUMINUM WALL GUARDS

- A. Secure brackets to walls with fasteners, spaced in accordance with manufacturer's installation instructions.

3.5 STAINLESS STEEL WALL GUARDS

- A. Space brackets at not more than three feet on centers and anchor to the wall in accordance with manufacturer's installation instructions.

3.6 DOOR, DOOR FRAME PROTECTION

- A. Surfaces to receive protection shall 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 manufacturers specific instructions.
- C. Apply with adhesive in controlled environment according to manufacture's recommendations.
- D. Protection installed on fire rated doors and frames shall 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.

3.7 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 10 28 00**TOILET AND BATH ACCESSORIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies manufactured items usually used in dressing rooms, toilets, baths, locker rooms and at sinks in related spaces.
- B. Items Specified:
1. Paper towel dispenser.
 2. Combination paper towel dispenser and disposal unit.
 3. Waste receptacles.
 4. Toilet tissue dispenser.
 5. Grab Bars: (10800-1.DWG).
 6. Shower curtain rods: (10800-2.DWG) and (10800-3.DWG).
 7. Clothes hooks, robe or coat.
 8. Towel bars.
 9. Metal framed mirror: (10800-7.DWG).
 10. Medicine cabinet.
 11. Foot operated soap dispenser.
 12. Soap dishes.
 13. Paper cup dispenser.
 14. Mop racks.
 15. Stainless steel shelves, [**Type 44**][**Type 45**][**Type 45C**]. (10801-1.DWG)
 16. Stainless steel shelves at wheelchair lavatory.
 17. Other items shown on the drawings.
- C. This section also specifies custom fabricated items used in toilets and related spaces.

1.2 RELATED WORK

- A. Sustainable design requirements and procedures including submittal requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.
- B. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- C. Color of finishes: Section 09 06 00, SCHEDULE FOR FINISHES

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- D. Ceramic toilet and bath accessories: Section 09 30 13, CERAMIC TILING
- E. Custom fabricated accessories: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
- F. Shower curtain break away pendant chain hooks: Section 10 21 23, CUBICLES.
- G. Color of vinyl fabric: Section 09 06 00, SCHEDULE FOR FINISHES.
- H. Manufactured toilet and bath accessories: Section **10 28 00**, TOILET AND BATH, ACCESSORIES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings:
 - 1. Each product specified.
 - 2. Paper towel dispenser and combination dispenser and disposal units.
 - 3. Metal framed mirrors, showing shelf where required, fillers, and design and installation of units when installed on ceramic tile wainscots and offset surfaces.
 - 4. Shower Curtain rods, showing required length for each location.
 - 5. Grab bars, showing design and each different type of anchorage.
 - 6. Medicine cabinets showing design and installation.
 - 7. Foot operated soap dispenser, showing anchorage and components.
 - 8. Show material and finish, size of members, and details of construction, installation and anchorage of mop racks.
- C. Samples:
 - 1. One of each type of accessory specified.
 - 2. After approval, samples may be used in the work.
- D. Manufacturer's Literature and Data:
 - 1. All accessories specified.
 - 2. Show type of material, gages or metal thickness in inches, finishes, and when required, capacity of accessories.
 - 3. Show working operations of spindle for toilet tissue dispensers.
 - 4. Mop racks.
- E. Manufacturer's Certificates:
 - 1. Attesting that soap dispensers are fabricated of material that will not be affected by liquid soap or aseptic detergents, PhisoHex and solutions containing hexachlorophene.
 - 2. Anodized finish as specified.

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1.4 QUALITY ASSURANCE

- A. Each 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 accessory type shall be the same and be made by the same manufacturer.
- C. Each accessory shall be assembled 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 PACKAGING AND DELIVERY

- A. Pack accessories individually to protect finish.
- B. Deliver accessories to the project only when installation work in rooms is ready to receive them.
- C. Deliver inserts and rough-in frames to site at appropriate time for building-in.
- D. Deliver products to site in sealed packages of containers; labeled for identification with manufacturer's name, brand, and contents.

1.6 STORAGE

- A. Store products in weathertight and dry storage facility.
- B. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. A167-99(R2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - 2. A176-99(R2004) Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip
 - 3. A269-07 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
 - 4. A312/A312M-06 Seamless and Welded Austenitic Stainless Steel Pipes

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5. A653/A653M-07 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 6. B221-06 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 7. B456-03 Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
 8. C1036-06 Flat Glass
 9. C1048-04 Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass
 10. D635-06 Rate of Burning and/or Extent and Time of Burning of Self Supporting Plastics in a Horizontal Position
 11. F446-85 (R2004) Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area.
 12. A269-07 Seamless and Welded Austenitic Stainless Steel Tubing for General Service
 13. D3453-01 Flexible Cellular Materials - Urethane for Furniture and Automotive Cushioning, Bedding, and Similar Applications
 14. D3690-02 Vinyl-Coated and Urethane-Coated Upholstery Fabrics
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500 Series Metal Finishes Manual
 2. AMP 500-505-88 Metal Finishes Manual and Finishes for Stainless Steel
- D. American Welding Society (AWS):
1. D10.4-86 (R2000) Welding Austenitic Chromium-Nickel Stainless Steel Piping and Tubing
- E. Federal Specifications (Fed. Specs.):
1. A-A-3002 Mirrors, Glass
 2. FF-S-107C (2) Screw, Tapping and Drive
 3. FF-S-107C Screw, Tapping and Drive.
 4. WW-P-541E(1) Plumbing Fixtures (Accessories, Land Use) Detail Specification

PART 2 - PRODUCTS**2.1 MATERIALS****A. Stainless Steel:**

1. Plate or sheet: ASTM A167, Type 302, 304, or 304L, except ASTM A176 where Type 430 is specified, 0.0299-inch thick unless otherwise noted

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- 2. Tube: ASTM A269, Alloy Type 302, 304, or 304L.
- B. Stainless Steel Tubing: ASTM A269, Grade 304 or 304L, seamless or welded.
- C. Stainless Steel Pipe: ASTM A312; Grade TP 304 or TP 304L.
- D. 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 (use in Mental Health and Behavior Nursing Unit Psychiatric Patient Areas and Security Examination Rooms where mirrors and glass are specified).
- E. Foam Rubber: ASTM D3453, Grade BD, Type 2.
- F. Vinyl Covering: ASTM D3690, Vinyl coated fabric, Class A.

2.2 FASTENERS

- A. Concealed Fasteners: Steel, hot-dip galvanized (except in high moisture areas such as showers or bath tubs use stainless steel).
- B. Toggle Bolts: For use in hollow masonry or frame construction.
- C. Hex bolts: For through bolting on thin panels.
- D. Adhesive: As recommended by manufacturer for products to be joined.

2.3 FINISH

- A. In accordance with NAAMM AMP 500 series.
- B. Anodized Aluminum:
 - 1. AA-C22A41: Chemically etched medium matte, with clear anodic coating, Class I Architectural, 0.7-mil thick.
 - 2. AA-C22A44: Chemically etched medium matte with electrolytically deposited metallic compound, integrally colored coating Class I Architectural, 0.7-mil thick finish. Dyes will not be accepted.

2.4 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.

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- 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, except stainless steel, anchors and fastening devices.
- H. Shop assemble accessories and package with all components, anchors, fittings, fasteners and keys.
- I. Key items alike.
- J. Provide templates and rough-in measurements as required.
- K. Round and deburr edges of sheets to remove sharp edges.

2.5 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 either spring tension cam lock or tumbler lock, keyed alike, at top and a refill sight slot in front.

2.6 COMBINATION PAPER TOWEL DISPENSER AND DISPOSAL UNITS

- A. Semi-recessed type.
- B. Fabricate of stainless steel.
- C. Dispensing capacity for 400 sheets of any type of paper toweling.
- 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 liter (10.5 gallon) capacity, fabricated of mm (0.018-inch) thick stainless steel.

2.7 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.

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- D. Provide removable waste receptacle of approximately (12 gallon) capacity, fabricated of stainless steel.
- E. Waste receptacle key locked in place.

2.8 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.

2.9 GRAB BARS

- A. Fed. Spec WW-P-541/8B, Type IV, bars, surface mounted, Class 2, grab bars and ASTM F446.
- B. Fabricate of either stainless steel or nylon coated steel, except use only one type throughout the project:
 - 1. Stainless steel: Grab bars, flanges, mounting plates, supports, screws, bolts, and exposed nuts and washers.
 - 2. Nylon Coated Steel: Grab bars and flanges complete with mounting plates and fasteners. [**Color is specified under Section 09 06 00, SCHEDULE FOR FINISHES.**]
- C. Concealed mount, except grab bars mounted at floor, swing up and on metal toilet partitions.
- D. Bars:
 - 1. Fabricate from 38 mm (1-1/2 inch) outside diameter tubing.
 - a. Stainless steel, minimum 1.2 mm (0.0478 inch) thick.
 - b. Nylon coated bars, minimum 1.5 mm (0.0598 inch) thick.
 - 2. Fabricate in one continuous piece with ends turned toward walls, except swing up and where grab bars are shown continuous around three sides of showers, bars may be fabricated in two sections, with concealed slip joint between.
 - 3. Continuous weld intermediate support to the 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 of 2.65 mm (0.1046 inch) thick, approximately 75 mm (3 inch) diameter by 13 mm (1/2 inch) deep, with provisions for not less than three set screws for securing flange to back plate.
 - 2. Insert grab bar through center of the flange and continuously weld perimeter of grab bar flush to back side of flange.

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- F. In lieu of providing flange for concealed mounting, and back plate as specified, grab rail may be secured by being welded to a back plate and be covered with flange.

2.10 CLOTHES HOOKS-ROBE OR COAT

- A. Fabricate hook units either of chromium plated brass with a satin finish, or stainless steel, using 6 mm (1/4 inch) minimum thick stock, with edges and corners rounded smooth to the thickness of the 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 the wall flange, provided with concealed fastenings.

2.11 METAL FRAMED MIRRORS

- A. Spec. A-A-3002 metal frame; anodized aluminum or stainless steel, type 302 or 304.
- B. Mirror Glass:
1. Minimum 6 mm (1/4 inch) thick.
 2. Set mirror in a protective vinyl glazing tape.
 3. Use tempered glass for mirrors in Mental Health and Behavioral Nursing units.
- C. Frames:
1. Channel or angle shaped section with face of frame not less than 9 mm (3/8 inch) wide. Fabricate with square corners.
 2. Use either 0.9 mm (0.0359 inch) thick stainless steel, chrome finished steel, or extruded aluminum, with clear anodized finish 0.4 mils thick.
 3. Filler:
 - a. Where mirrors are mounted on walls having ceramic tile wainscots not flush with wall above, provide fillers at void between back of mirror and wall surface.
 - b. Fabricate fillers from same material and finish as the mirror frame, contoured to conceal the void behind the mirror at sides and top.
 4. Attached Shelf for Mirrors:
 - a. Fabricate shelf of the same material and finish as the mirror frame.
 - b. Make shelf approximately 125 mm (five inches) in depth, and extend full width of the mirror.
 - c. Close the ends and the front edge of the shelf to the same thickness as the mirror frame width.
 - d. Form shelf for aluminum framed mirror as an integral part of the bottom frame member. Form stainless steel shelf with concealed brackets to attach to mirror frame.

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D. Back Plate:

1. Fabricate backplate for concealed wall hanging of either zinc-coated, or cadmium plated 0.9 mm (0.036 inch) thick sheet steel, die cut to fit face of mirror frame, and furnish with theft resistant concealed wall fastenings.
2. Use set screw type theft resistant concealed fastening system for mounting mirrors.

2.12 MOP RACKS

A. Minimum 1.0M (40 inches) long with five holders.

B. Clamps:

1. Minimum of 1.3 mm (0.050-inch) thick stainless steel bracket retaining channel with a 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 of 1 mm (0.0375 inch) thick stainless steel hat shape channel to hold clamps away from wall as shown.
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.

E. Finish on stainless Steel: AMP 503-No. 4.

2.13 STAINLESS STEEL SHELVES (Type 44)

A. Form brackets of 3 mm (1/8-inch) thick steel as shown. Drill brackets for 6 mm (1/4-inch) anchor bolts.

B. Weld or Screw brackets to shelves.

2.14 STAINLESS STEEL SHELVES AT WHEELCHAIR LAVATORY

A. Back wall mounted:

1. Fabricate to size and shape shown of plate and tube.
 2. Turn up edges and weld corners of shelf.
 3. Weld tube to back plate and shelf, weld back plate to shelf, filler plate to tube, and corners of shelf with continuous welds.
 4. Drill back plate for 6 mm (1/4 inch) anchor bolts.
- EXECUTION

2.15 PREPARATION

A. Before starting work notify Contracting Officer's Representative in writing of any conflicts detrimental to installation or operation of units.

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- B. Verify with the Contracting Officer's Representative the exact location of accessories.

2.16 INSTALLATION

- A. Set work accurately, in alignment and where shown. Items shall be plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.
- B. Toggle bolt to steel anchorage plates in frame partitions or hollow masonry. Expansion bolt to concrete or solid masonry.
- C. Install accessories in accordance with the manufacturer's printed instructions and ASTM F446.
- D. Install accessories plumb and level and securely anchor to substrate.
- E. Install accessories in a manner that will permit the accessory to function as designed and allow for servicing as required without hampering or hindering the 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 as needed.
- 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 wall mirrors 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.

2.17 SCHEDULE OF ACCESSORIES**2.18 CLEANING**

- A. After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

2.19 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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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):
 - D4802-10.....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 bottom of cabinet is 914 mm (36 inches) above finished floor.

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SECTION 11 70 00**HEALTHCARE EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes:**

1. Healthcare equipment as indicated in the Medical Equipment Schedule furnished and installed as follows:
 - a. Contractor furnished, Contractor installed (CC) or (CFCI).
 - b. Government furnished, Contractor installed (VC) or (GFCI).
 - c. Government furnished, Government installed (VV) or (GFGI).
2. Equipment supports, anchorage.
3. Water, medical gas, electrical service, and other utility service requirements.

1.2 RELATED WORK:

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

1.3 GOVERNMENT FURNISHED EQUIPMENT

- A. Refer to Division 01 Section "General Requirement", Article "Government-Furnished Property."

B. Government's Responsibilities:

1. Government shall deliver to the Contractor at the Medical Center, Government-furnished property as shown on the Schedule.
2. Arrange for delivery of Government-furnished equipment.

C. Contractor's Responsibilities:

1. Contractor shall be prepared to receive Government-furnished equipment and store or place such equipment not less than 90 days before project Completion Date.
2. Notify Contracting Officer in writing, 60 days in advance, of date on which Contractor will be prepared to receive Government-furnished equipment.
3. Receive and unload Government-furnished equipment at site, and arrange for a joint inspection with a representative of the Government, and acknowledge receipt of equipment, make notations, and immediately furnish the Government representative with a written statement as to its condition or shortages.
- 4.

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- a. Upon receipt of Government-furnished equipment, the equipment becomes the responsibility of the Contractor until such time as acceptance of contract work is made by the Government.
 5. 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.
 6. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
 7. Furnish supervision of installation of equipment at construction site by qualified factory trained technicians regularly employed by the equipment manufacturer.
- D. Contractor's Responsibilities for Government-Furnished, Government Installed Equipment (VV):
1. Cooperate and coordinate with Government for delivery, storage, and installation.

PART 2 - PRODUCTS**2.1 MEDICAL EQUIPMENT**

- A. Refer to Medical Equipment Schedule.

2.2 EQUIPMENT ANCHORING AND SUPPORTS

- A. Refer to Division 5 Section "Metal Fabrications", and structural Drawings, for equipment supports fabrication and anchoring requirements.

2.3 UTILITY SERVICE CONNECTIONS AND REQUIREMENTS

- A. Comply with equipment manufacturer's requirements and as specified in Division 22, Plumbing; Division 23, Heating, Ventilating, and Air Conditioning; Division 26, Electrical; and Division 27, Communications.

2.4 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 12 24 00**WINDOW SHADES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section includes manually operated roller shades. Window shades shall be furnished complete, including brackets, fittings and hardware.

1.2 RELATED WORK

- A. Color of shade cloth: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Section 09 22 16, NON-STRUCTURAL METAL FRAMING for backing plates.
- C. Samples:
 - 1. Shade cloth, each type, 600 mm (24 inch) square, including cord and ring, showing color, finish and texture.
- D. Manufacturer's literature and data; showing details of construction and hardware for:
 - 1. Cloth and window shades

1.4 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. American Society for Testing and Materials (ASTM):
 - 1. A167-99 (R2004) Stainless and heat-Resisting Chromium- Nickel Steel Plate, Sheet and Strip
 - 2. B221/B221M-07 Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
 - 3. D635-06 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
 - 4. D648-07 Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position

1.5 WARRANTY

- A. Work subject to the terms of the Article "Warranty of Construction", FAR

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clause 52.246-21. Provide manufacturer's specialty warranty as follows:

1. Roller Shade Hardware: Manufacturer's standard non-depreciating 25 year limited warranty.
2. Shade Cloth: Manufacturer's standard non-depreciating 10 year limited warranty.

PART 2 - PRODUCTS**2.1 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS**

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 1. Bead Chains: Stainless steel.
 2. Loop Length: Full length of roller shade.
 3. Limit Stops: Provide upper and lower ball stops.
 4. Chain-Retainer Type: Clip, jamb mount
- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
 1. Roller Drive-End Location: Right side of inside face of shade.
 2. Direction of Shadeband Roll: Regular, from back of roller.
 3. Shadeband-to-Roller Attachment: Manufacturer's standard method.
- C. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- D. Shade Cloth: Light-filtering woven fabric; stain and fade resistant, non-raveling.
 1. Type: Woven PVC-coated fiberglass and PVC-coated polyester.
 2. Weave: Basketweave.
 3. Thickness: Manufacturer's standard.
 4. Openness Factor: 3 percent.
 5. Color: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Shade Bands: Construction of shade band includes the fabric, the hem weight,

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hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.

- a. Fabricate shade cloth to completely fill openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
- b. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
- c. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shade cloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- d. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
- e. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.
1. Shade band and Shade Roller Attachment:
 - a. Provide for positive mechanical engagement with drive / brake mechanism.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.
- F. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
 1. Brackets: Minimum 3.18 mm (1/8 inch) thick plated steel, or thicker, as required to support 150 percent of the full weight of each shade.
 2. Provide shade hardware system that allows for field adjustment of or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).

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2.2 INSTALLATION ACCESSORIES

- A. Exposed Headboxes and Bottom Boxes: Rectangular, extruded-aluminum enclosure with removable closures.
 - 1. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than height indicated on Drawings.
 - 2. Color and Finish: As selected by the VA COR from manufacturer's full range.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Window 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.
 - 1. Locate rollers in level position as high as practicable at heads of windows to prevent infiltration of light over rollers.
 - 2. Where extension brackets are necessary, on mullions or elsewhere, for alignment of shades, provide metal lugs, and rigidly anchor lugs and brackets.
 - 3. Place brackets and rollers so that shades will not interfere with window and screen hardware.
 - 4. Shade installation methods not specifically described, are subject to approval of VA COR.

3.2 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with General Contractor's Waste Management Plan and Section 01 74 19.
- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the General Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers.

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SECTION 12 36 00

QUARTZ COUNTERTOPS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies casework countertops.

1.2 RELATED WORK

- A. Custom casework: SECTION 06 20 00, FINISH CARPENTRY.
- B. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.
- C. 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:
- C. Shop Drawings:
 - 1. Show dimensions of section and method of assembly.
 - 2. Show details of construction at 1/2 scale.
 - 3. Apply WI Certified Compliance Program label or AWI Quality Certification Program label to Shop Drawings.
- D. Samples:
 - 1. 150 mm (6 inch) square samples each top.

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 Society for Testing and Materials (ASTM):
 - 1. C97/C97M-09 Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone
 - 2. C99/C99M-09 Test Method for Modulus of Rupture of Dimension Stone
 - 3. C170/C170M-09 Test Method for Compressive Strength of Dimension Stone

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4. C482-02(2009) Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste
 5. C484-99(2009) Test Method for Thermal Shock Resistance of Glazed Ceramic Tile
 6. C501-84(2009) Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser
 7. C531-00(2012) Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes
 8. C648-04(2009) Test Method for Breaking Strength of Ceramic Tile
 9. E84-12c Test Method for Surface Burning Characteristics of Building Materials
 10. E662-12a Test Method for Specific Optical Density of Smoke Generated by Solid Materials
- C. U.S. Department of Commerce, Product Standards (PS):
1. PS 1-95 Construction and Industrial Plywood

PART 2 - PRODUCTS**2.1 COUNTERTOPS, GENERAL**

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.
- B. Provide labels and certificates from AWI or WI certification program indicating that woodwork, including installation, complies with requirements of grades specified.

2.2 MATERIALS

- A. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.
1. Performance Characteristics:
 - a. Density(Hydrostatic Scale): 2.4 g/cm³
 - b. Moisture Absorption (ASTM C97): 0.02 percent
 - c. Modulus of Rapture (ASTM C99): 6,800 psi
 - d. Compressive Strength (ASTM C170): 24,750 psi
 - e. Abrasion Resistance (ASTM C-501): 223
 - f. Bond Strength (ASTM C482): 205 psi
 - g. Thermal Shock (ASTM C484): Passes 5 cycles
 - h. Coefficient of Thermal Expansion (ASTM C531): 1.2 x 10⁻⁵ inch/°F
 - i. Breaking Strength of Tile (ASTM C648): 3,661 lbf
 - j. Fire Test Characteristics - Flame Spread (ASTM E84): 17

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- k. Fire Test Characteristics - Smoke Density (ASTM E662): Flaming - 196; non-flaming - 69
 - 1. Stain Resistance (ANSI Z-124.6): Unaffected
 - 2. Thickness: 20 mm.
 - 3. Color: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.
 - 4. Material of uniform mixture throughout.
- B. Plywood: PS 1, Exterior type, veneer grade AC not less than five ply construction.

2.3 COUNTERTOPS

- A. Fabricate in accordance with Architectural Woodwork Standards (AWS) premium grade.
- B. Fabricate in largest sections practicable.
- C. Fabricate with joints flush on top surface.
- D. Fabricate with end splashes where against walls or cabinets.
- E. Drill or cutout for sinks, and penetrations.
 - 1. Accurately cut for size of penetration.

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.

3.2 PROTECTION AND CLEANING

- A. Tightly cover and protect against dirt, water, and chemical or mechanical injury.
- B. Clean at completion of work.

3.3 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

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- B. To the greatest extent possible, separate reusable and recyclable products from contaminated waste and debris in accordance with the Contractor's Waste Management Plan. Place recyclable and reusable products in designated containers and protect from moisture and contamination.

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SECTION 13 05 41**SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Provide gravity and seismic restraint in accordance with the requirements of this section in order to maintain the integrity of nonstructural components of the building and utility structures so that they remain safe and functional in case of seismic event.
- B. The design to resist seismic load shall be based on Seismic Design Categories per section 4.0 of the VA Seismic Design Requirements (H-18-8) dated August 2013, <http://www.cfm.va.gov/til/etc/seismic.pdf>.
- C. Definitions: Non-structural components are components or systems that are not part of the building's or utility structures' structural system whether inside or outside, above or below grade. Non-structural components include:
 - 1. Architectural Elements: Facades that are not part of the structural system and its shear resistant elements; exterior wall framing; 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.
 - 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.
 - 3. Mechanical Elements: Heating, ventilating, and air-conditioning systems; medical gas systems; plumbing systems; sprinkler systems; steam piping; chilled water piping; pneumatic systems; boiler equipment and components.
 - 4. Transportation Elements: Mechanical, electrical and structural elements for transport systems, i.e., elevators and dumbwaiters, including hoisting equipment and counterweights.
 - 5. Anchor Furniture to floors or other structure.
 - 6. Anchor equipment as indicated on the drawings.
 - 7. Provide wall backing as required to accommodate furniture and equipment anchorages.

1.2 RELATED WORK:

- A. Refer to all other divisions contained in these specifications for information related to the non-structural components defined above.

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1.3 QUALITY CONTROL:**A. Shop-Drawing Preparation:**

1. Have gravity support and seismic-force-restraint shop drawings and calculations prepared by a professional structural engineer experienced in the area of seismic force restraints. The professional structural engineer shall be registered in the state of California.
2. Submit design tables and information used for the design-force levels, stamped and signed by a professional structural engineer registered in the State of California.

B. Coordination:

3. Do not install gravity supports or seismic restraints until submittals are approved by the Contracting Officer's Representative.
4. Coordinate and install trapezes or other multi-pipe hanger systems prior to pipe installation.

C. Seismic Certification:

5. In structures assigned to IBC Seismic Design Category C, D, E, or F, permanent equipments and components are to have Special Seismic Certification in accordance with requirements of section 13.2.2 of ASCE 7 except for equipment that are considered rugged as listed in section 2.2 OSHPD code application notice CAN No. 2-1708A.5, and shall comply with section 13.2.6 of ASCE 7.

1.4 SUBMITTALS:**A. Submit a coordinated set of equipment anchorage drawings prior to installation including:**

1. Description, layout, and location of items to be anchored or braced with anchorage or brace points noted and dimensioned.
2. Details of anchorage or bracing at large scale with all members, parts brackets shown, together with all connections, bolts, welds etc. clearly identified and specified.
3. Numerical value of design seismic brace loads imparted onto structure.
4. For expansion bolts, include design load and capacity if different from those specified. Provide current ICC-ES reports for anchors showing compliance with referenced codes and approved for use in cracked concrete (seismic). Refer to Section 05 12 00 STRUCTURAL STEEL FRAMING for additional wedge anchor criteria.
5. Seal of registered structural engineer responsible for design.

B. Submit prior to installation, a coordinated set of bracing drawings for seismic protection of piping, with data identifying the various support-to-structure connections and seismic bracing structural connections, include:

1. Single-line piping diagrams on a floor-by-floor basis. Show all suspended piping for a given floor on the same plain.

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2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
 3. Pipe contents.
 4. Structural framing.
 5. Location of all gravity load pipe supports and seismic braces and spacing requirements.
 6. Numerical value of gravity and seismic load reactions imparted onto structure.
 7. Type of connection (Vertical support, vertical support with seismic brace etc.).
 8. Seismic brace reaction type (tension or compression). Details illustrating all support and bracing components, methods of connections, and specific anchors to be used.
 9. Seal of registered structural engineer responsible for design.
- C. Submit prior to installation, bracing drawings for seismic protection of suspended ductwork and suspended electrical and communication cables, include:
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 the structure from support and bracing components.
 3. Maximum spacing of hangers and bracing.
 4. Seal of registered structural engineer responsible for design.
- D. Submit structural design bracing and anchorage calculations and details for all non-structural components identified in this specification, prepared and sealed by the registered structural engineer specified above in paragraph 1.3A.
- E. Prior to installation, submit details for typical ceiling and lighting fixture seismic bracing, and any special details for locations where typical details do not apply.
- F. Submit for concrete anchors, the appropriate ICC evaluation reports, OSHPD pre- approvals, or lab test reports verifying compliance with OSHPD Interpretation of Regulations 28-6.

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):
1. 318-11 Building Code Requirements for Structural Concrete and Commentary.

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2. 355.2-07 Qualification for Post-Installed Mechanical Anchors in Concrete and Commentary
- C. American Institute of Steel Construction (AISC):
 1. Load and Resistance Factor Design, Volume 1, Second Edition.
- D. American Society for Testing and Materials (ASTM):
 1. A36/A36M-08 Standard Specification for Carbon Structural Steel.
 2. A53/A53M-10 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 3. A307-10 Standard Specification for Carbon Steel Bolts and Studs; 60,000 PSI Tensile Strength.
 4. A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 5. A325M-09 Standard Specification for High-Strength Bolts for Structural Steel Joints [Metric].
 6. A490-10 Standard Specification for Heat-Treated Steel Structural Bolts, 150 ksi Minimum Tensile Strength.
 7. A490M-10 (REV A-04) Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric].
 8. A500/A500M-10 Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 9. A501-07 Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 10. A615/A615M-09 Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 11. A992/A992M-06 Standard Specification for Steel for Structural Shapes for Use in Building Framing.
 12. A996/A996M-09 Standard Specification for Rail-Steel and Axel-Steel Deformed Bars for Concrete Reinforcement.
 13. E488-96(R2003) Standard Test Method for Strength of Anchors in Concrete and Masonry Elements.
- E. American Society of Civil Engineers (ASCE 7) Latest Edition.
- F. International Building Code (IBC) Latest Edition.
- G. VA Seismic Design Requirements, H-18-8, August 2013
- H. National Uniform Seismic Installation Guidelines (NUSIG).
- I. Sheet Metal and Air Conditioning Contractors National Association(SMACNA):
 1. Seismic Restraint Manual - Guidelines for Mechanical Systems, 1998 Edition and Addendum.

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1.6 REGULATORY REQUIREMENT:

- A. IBC Latest Edition. $I=1.5$ for all structures, unless otherwise noted on the drawings.
- B. Short-period acceleration, SDS, for use in calculation of seismic anchorage and bracing forces as required by the IBC, shall be taken per the design drawings.
- C. Seismic Restraint Exceptions: As specified in Chapter 13 of ASCE 7-10.

PART 2 - PRODUCTS**2.1 STEEL:**

- A. Structural Steel: ASTM A36.
- B. Structural Tubing: ASTM A500, Grade B.
- C. Steel Pipe: ASTM A53/A53M, Grade B.
- D. Bolts & Nuts: ASTM **A307**.

2.2 CAST-IN-PLACE CONCRETE:

- A. Concrete: 28 day strength, $f'c = 30$ MPa (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 and gravity 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 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.

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- E. Anchorage, bracing and connection details shown on the drawings indicate the general design intent. The final anchorage and bracing design for non-structural components is to be determined by the registered structural engineer specified above in paragraph 1.3A.

3.2 EQUIPMENT RESTRAINT AND BRACING:

- A. See construction documents for equipment to be restrained or braced.

3.3 MECHANICAL DUCTWORK AND PIPING; STEAM AND CHILLED WATER 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. Seismic Restraint of Piping:
 - 1. Design criteria:
 - a. IBC 2012 seismic criteria.
 - b. VA H18-8 Seismic Design Requirements.
 - c. See the structural drawings for additional seismic design criteria.
- E. 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.

3.5 CEILINGS AND LIGHTING FIXTURES

- A. At regular intervals, laterally brace suspended ceilings against lateral and vertical movements, and provide with a physical separation at the walls. Lateral bracing of ceilings it to comply with all applicable code requirements for the specified seismic design category.
- B. Independently support and laterally brace all lighting fixtures. Refer to applicable portion of lighting specification, Section 26 51 00, INTERIOR LIGHTING.

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3.6 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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SECTION 13 10 10**BULLET RESISTANT PARTITIONS AND EQUIPMENT****PART 1 - GENERAL****1.1 DESCRIPTION**

A. This Section specifies :

1. Bullet Resistant Transaction Windows, with telephone handsets.
2. Bullet Resistant Deal Trays.
3. Bullet Resistant Package Transfer.
4. Bullet Resistant Composite (Fiberglass)

1.2 RELATED WORK

- A. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- B. Section 06 10 00, ROUGH CARPENTRY.
- C. Section 08 71 00, HARDWARE
- D. Section 08 80 00, GLAZING.
- E. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 QUALITY CONTROL - QUALIFICATIONS:

- A. Manufacturer Qualifications: All primary products specified in this section will be supplied by a single manufacturer with a minimum of ten (10) years experience.
- B. Installer Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
 - a. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 2. Refinish mock-up area as required to produce acceptable work.

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1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Submit Manufacturer approved shop drawings detailing plan, section and elevation views as necessary to ensure proper field installation procedures. Coordinate locations with those listed in the Contract Drawings.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certificates stating that all materials meet the requirements of UL 752
- G. Certification: Letter of certificates from manufacturer indicating that units comply with requirements for levels of resistance specified and meets requirements of Certification Standards Forced Entry and Ballistic Resistance of Structural Systems.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site in original sealed packages or containers; labeled for identification with manufacturer's name and brand.
- B. Store products in weathertight and dry storage facility.
- C. Protect from damage from handling, weather and construction operations before, during and after installation in accordance with manufacturer's instructions.
- D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities

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having jurisdiction

1.7 **PERFORMANCE REQUIREMENTS**

Fabricate and install Forced Entry/Ballistic Resistant (FE/BR) assemblies to achieve indicated levels of resistance. Extend resistance to include anchorages, interfaces with adjoining substrates, and hardware. Security attacks shall be unable to penetrate through closed/locked assemblies in manner described; it is recognized that such attacks may damage units beyond repair and reuse, requiring replacement of work by Government.

1.8 **APPLICABLE PUBLICATIONS**

A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.

B. ASTM B 209/B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. NIJ Standard 0108.01 - (National Institute of Justice) Standard for Ballistic Resistant Protective Materials.

D. Underwriters Laboratories: UL 752 - Standard for Bullet Resisting Equipment.

PART 2 - PRODUCTS

2.1 **COMPONENTS**

A. Glazing: Bullet Resistant Glazing:

Glazing Type: Laminated polycarbonate.

Rating: UL 752 Level 3.

Glazing Thickness: 1 1/4 inch (32mm).

1. All panels finish 48 inches (1219mm) above the teller riser, 60 inches (1524mm) above the teller counter or to the underside of an existing soffit if lower than 100 inches (2540mm) Above the Finished Floor (A.F.F.).
2. All transparent arched panels spanning teller transaction spaces must be symmetrical, notched from the edges of the teller risers and to 72 inches (1829mm) A.F.F. at the apex of the arch. A transparent backer shall overlap the notch 4 inches (102mm) around and be set back 1 1/2 inches (39mm). Arch centerline will bisect the center of the stainless steel money tray.
3. All transparent panels within a vertical baffle system span the teller risers or the money trays edge to edge. A transparent backer will overlap the money trays by 3 inches (76mm), be set back 2 inches (52mm) and extend to match the other transparent panels.

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- B. **Aluminum sections:** to be manufactured in accordance with ASTM B209, Extruded aluminum alloy 6063 T5 Anodized or powder coated finish to match the existing décor and be free of sharp edges or burrs when in place. Glazing Channel: U-Channel specifically designed for securing transparencies tightly in place. Angles and stops are only acceptable for top attachment.

1. Frame to be 18 ga. stainless steel . The bottom of the glazing to be capped with corresponding material on the frame (ie: stainless steel on stainless steel). Provide a shelf 2" thick with a recessed deal tray. The shelf to be full width of window, 12" deep, centered under the glazing and covered with stainless steel 18 ga. #4 finish.

2.2 BULLET RESISTANT TRANSACTION WINDOW

A. Construction:

1. Model: Interior - Natural Voice Transmission (NVR) in addition to dual handset for private conversations.
2. Rating: UL 752 Level 3.
3. Frame: Stainless Steel tube and fixed glazing channel. Glazing is wrapped with Stainless Steel channels.
4. Frame: Stainless Steel.
5. Counter Construction: Custom counter
6. Deal Tray: Stainless steel - recessed.

- B. Glazing: As specified in Article 2.1A of this section. Meets Underwriters Laboratories Standard 752 for bullet resistance and/or tested by H.P. White Laboratory for specified bullet resistance.

1. Glazing Type: Laminated polycarbonate.

C. Voice Transmission:

1. System Type: Natural Voice Transmission.

- D. Dual Telephone communication system, with handset for privacy, both sides of window.

2.3 BULLET RESISTANT DEAL TRAY:

- A. Deal tray to be Recessed 18 ga. Brushed stainless steel, # 4 finish 14" x 8" from the outside edge of flanges with a clear opening.

2.4 BULLET RESISTANT PACKAGE TRANSFER

- A. Interlocking Package Passer: Rectangular box built from transparent bullet resistant glazing material, with doors on the customer and employee sides. A mechanical interlocking mechanism prevents the opening of both doors

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simultaneously, allowing small packages to be passed through a barrier without a breach of security.

B. Glazing: As specified in Article 2.1 of this section. Meets Underwriters Laboratories Standard 752 for bullet resistance and/or tested by H.P. White Laboratory for specified bullet resistance.

C. Rating: UL 752 Level 3.

D. Operation: Package Passer to have hinged doors controlled by mechanical interlocking mechanism allowing only one door to be opened at a time.

E. Base: Particle board with black plastic laminate covering.

F. Hardware: 1/4-20 steel machine screws.

G. Size to be OD 16"W x 14" H x 14" D

2.5 BULLET RESISTANT COMPOSITE (FIBERGLASS)

A. Bullet resistant fiberglass armor tested and approved to meet U.L. 752 for the level of protection specified. The panels shall be made of multiple layers of woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets.

B. Through the design, manufacturing techniques and material application the Bullet Resistant Fiberglass shall be of the "non-ricochet" type. This design is intended to permit the encapture and retention of an attacking projectile lessening the potential of a random injury or lateral penetration.

C. Fabrication: the technique and materials used shall provide the controlled internal delamination to permit the encapture of the penetrating projectile with Carbide grit edge saw blades. Exposed fasteners shall be non-corrosive

Rating: UL 752 Level 3, UN Listed.

Ballistic Data: 44 Mag, 240 Gr, 1350 Ft. Sec, SWC

Panel Thickness: 1/2" inch

Panel Weight: 4.0 Lbs per square foot (19.53 kg/sm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

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3.2 PREPARATION

- A. Clean and prepare all surfaces per manufacturers recommendations for achieving the best results for the substrate under the project conditions.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions
- C. Prior to installing the bullet resistive material, the contractor shall verify that all supports have been installed as required by the contract documents and architectural drawings, and approved shop/CAD drawings, if required. Installer shall notify architect of any unsatisfactory preparation that is responsibility of another installer.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions. Do not begin installation until openings have been verified and surfaces properly prepared in accordance with Drawings. Install in accordance with manufacturer's instructions and UL 752.
- B. Set units accurately, plumb, and level.
- C. At Bullet Resistant Fiberglass - All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer shall be 4" (2" on each panel) or a 2" overlap minimum. No rigid high-density material shall be used adjacent to the panel's inner surface, allow ¼" gap.

3.4 CLEANING

- A. After installation, clean items as recommended by the manufacturer and protect from damage until completion of the project.
- B. 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, with contact surfaces fit tight and even, without forcing or warping the components.

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