

PROJECT MANUAL

**Renovate Emergency
Department Facilities
Vol. 1 (1 of 3)**

CONSTRUCTION DOCUMENTS

The Design Partnership

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PREPARED FOR:

**VA MEDICAL CENTER, PALO ALTO,
CALIFORNIA**

3801 Miranda Avenue
Palo Alto, CA 94304

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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 and exterior portions of Building 100 on the first floor through the roof.
2. Excavation for new building expansion.
3. New concrete footings and structural steel, including connections to the existing building and providing for the expansion of the Emergency Department.
4. New exterior wall envelope and roofing.
5. New interior partitions, glazing, doors, partitions ceilings electrical, plumbing, mechanical, fire protection and low voltage work, as indicated in the Contract Documents.
6. Finishes, signage, accessories, casework and all other items to provide a new and completely functional expanded Emergency Department.
7. Phasing and all required work effort to maintain the existing functioning of the hospital 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.
8. Sitework and landscaping, underground utilities to accommodate the new work.
9. New rooftop air handlers as indicated with ductwork routed through the existing hospital to serve the new, expanded Emergency Department.
10. Reconfiguration of existing electrical and low-voltage conduits, racks, panels, cable trays, etc. to accommodate the new work and relocated Low Voltage IT Room and electrical rooms shown on the drawings. Phasing the relocation of such power and lighting circuits to maintain operation of all areas of the hospital served by the electrical room, including those outside of the renovated Emergency Department. Phasing of the relocation of

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low voltage systems to maintain functionality of the hospital inside and outside the Emergency Department.

- B. Visits to the VA Campus site by Bidders may be made only by appointment with the Contracting Officer's Representative.
- C. The VA has contracted separately with an Architect-Engineer firm who will render certain technical services during construction. Such 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.

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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:
- B. ALTERNATE NO. 1: Landscape Raised Planters
- C. ALTERNATE NO. 2: Landscape Benches and Bench Pads
- D. ALTERNATE NO. 3: Landscape Bid Alternate.
- E. ALTERNATE NO. 4: Wood Slat Ceiling at Entry
- F. ALTERNATE NO. 5: Wood Panel System / Plastic Laminate
- G. ALTERNATE NO. 6: Wood Panel System / Paint
- H. ALTERNATE NO. 7: Terrazzo Flooring at Entry
- I. ALTERNATE NO. 8: Sunshade
- J. ALTERNATE NO. 9: Office Walls / Furniture System
- K. ALTERNATE NO. 10: Reduced Expansion

1.3 SPECIFICATIONS AND DRAWINGS

- A. After award of contract, specifications and drawings will be available for download from a link provided by the Contracting Officer's Representative
- 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;

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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 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.

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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 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.

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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 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.

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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.
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.

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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.
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.

1.5 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

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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

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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.
- 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 Palo Alto Health Care System Memorandum SAFE 13-23. 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 Contracting Officer's Representative.

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- 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.
- 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.

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- 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 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.

1.6 OPERATIONS AND STORAGE AREAS

- A. The Contractor shall confine all operations (including storage of materials) on Government premises to areas authorized or approved by the Contracting Officer'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

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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 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.
- 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

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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 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. 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.
- K. 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

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- 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 INSTALLATIONS, 27 05 11 REQUIREMENTS FOR COMMUNICATIONS INSTALLATIONS 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.
- L. Abandoned Lines: All service lines such as wires, cables, conduits, ducts, pipes and the like, and their hangers or supports, which are to be abandoned but are not required to be entirely removed, shall be sealed, capped or plugged. 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.

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M. 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 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.

N. 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.

1.7 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.

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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 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

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that are to remain in place shall be adequately protected prior to starting work, and this protection shall be maintained intact until all work in the area is completed.

1.8 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 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

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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.
- 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

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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.

- 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.

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- 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.
- 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.

1.9 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.

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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 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 AT EXTENSION 62468.**
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.

1.10 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

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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.

1.11 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

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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.

- 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).

1.12 PHYSICAL DATA

- A. Data and information included in the Langan Treadwell Rollo Geotechnical Report, dated May 27, 2014, Project # 7504876614 will be made available to the contractor for their use. However data included in this report (test borings, hydrographic data, test pits, weather conditions, etc.) furnished or referred to is for the Contractor's information. The Government shall not be responsible for any interpretation of or conclusion drawn from the data or information by the Contractor. (FAR 52.236-4)

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

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- 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.
 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:

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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.
 - 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. Provide where directed, (for use of all Contractor and subcontractor employees) ample temporary sanitary toilet accommodations with suitable sewer and water connections; or, when approved by Contracting Officer's Representative, provide suitable dry closets where directed. Keep such

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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.

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.
- 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.

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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.

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

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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.

- 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

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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 are more specifically detailed in the various technical sections. Instructions for different items of equipment that are component parts of a complete system shall be given in an integrated, progressive manner. All instructors for every piece of component equipment in a system shall be available until instructions for all items included in the system have been completed. This is to assure proper instruction in the operation of inter-related systems. All instruction periods shall be at such times as scheduled by the 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

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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.
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.

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- 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 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.

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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 PHASING/CONSTRUCTION SEQUENCING & OCCUPANCY:

The project shall be phased as necessary to complete the work with minimal disruption to hospital operation. Coordinate sequence of work with the VA COR.

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SECTION 01 32 16.15
PROJECT SCHEDULE

PART 1- GENERAL

1.1 DESCRIPTION

- A. The Contractor shall develop a plan and schedule demonstrating fulfillment of the contract requirements (Project Schedule). The Contractor shall keep the Project Schedule up-to-date and shall utilize it for scheduling, coordinating and monitoring work under this contract (including all activities of subcontractors, equipment vendors and suppliers).

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.
- 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 contract.

1.3 SCHEDULES AND UPDATES

- A. The contractor shall provide monthly, to the Contracting Officer's Representative an updated Project Schedule.
- B. The contractor shall be responsible for the correctness and timeliness of any updated Project Schedule and payment requests.

1.4 PROJECT SCHEDULE SUBMITTAL

- A. Within 10 calendar days after receipt of Notice to Proceed, the Contractor shall submit the Project Schedule for the Contracting Officer's Representative's review and written approval. The submittal shall include project duration, phase completion dates, activities/events duration and activities/event allocated/loaded cost. Each activity/event on the schedule shall contain a name/number ID, description, duration, allocated cost, early start date, early finish date, late start date, late finish date and total float. The Project Schedule shall reflect the entire contract duration as defined in the contract. Changes/delays shall be entered at the first update after receipt of approval. The Contractor shall provide written requests for time extensions as a result of contract changes/delays.
- C. The Project Schedule shall constitute the approved Baseline Schedule until subsequently revised.
- D. The Project Schedule shall include all major work.

1.5 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 shall equal the total 90% contract price. The remaining 10% will be held until all requirements of the contract have been completed. The Contractor shall prorate overhead, profit and general conditions on all work activities/events for the entire project length. The contractor shall generate from this information cost curves indicating graphically the total percentage of work activity/event dollar value scheduled versus actual.
- D. The Contractor shall cost load activities/events for all work. Periodic payments shall be approved only for work activities that have been 100% completed and for equipment and material that has been delivered to the work site.

1.6 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 Representative's and Architect/Engineer's review and approval of shop drawings, equipment schedules, samples, templates, 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 adjustment of various systems and pieces of equipment, delivery of maintenance and operation manuals, instructions and maintenance tasks.
 - e. VA inspection and acceptance with a minimum duration of five work days at the end of each phase and immediately preceding any VA move required by the contract phasing for that phase.
 - f. VA activation period between each phase (sequence), which shall be approximately thirty (30) days and will be confirmed by the VA. Activation and relocation shall be fully completed for each phase before Contractor may begin the subsequent construction phase.

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- g. Contractor to provide a minimum of a thirty (30) day prior notification to the VA regarding the projected completion date of each phase (sequence).
 - 3. Break up the work into activities/events with a duration no longer than one reporting period, except as to non-construction activities/events and any activities/events for which the Contracting Officer's Representative 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 14 work days.
 - 4. Describe work activities/events clearly, so the work is readily identifiable for assessment of completion.
 - 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 Contracting Officer's Representative. 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 Contracting Officer's Representative's approval of the Project Schedule.

1.7 PAYMENT TO THE CONTRACTOR:

- A. The Contractor shall be entitled to a monthly progress payment upon approval of costs as determined from the currently approved updated Project Schedule. Monthly payment requests/invoices shall include: a listing of all agreed upon project schedule changes and associated data and an updated Project Schedule.
- B. Approval of the Contractor's invoice shall be contingent on, among other factors, the submittal of a satisfactory monthly update of the Project Schedule.

1.8 PAYMENT AND PROGRESS REPORTING

- A. Monthly schedule update meetings will be held on dates mutually agreed to by the Contracting Officer's Representative and the Contractor. Contractor 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 Contracting Officer's Representative three work days in advance of the scheduled update meeting.

1.9 RESPONSIBILITY FOR COMPLETION

- A. If it becomes apparent from the current revised monthly Project 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 Contracting Officer's Representative 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.

1.10 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, data and supporting evidence 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 required for 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 Representative's determination as to the total number of days of contract extension will be based upon the current Project Schedule for the time period in question and any other relevant information.
- B. Actual delays in activities/events which, according to the schedule, do not affect the extended and predicted contract completion date shown by the critical path in the network, will not be the basis for a change to the contract completion date. The Contracting Officer's Representative will, within a reasonable time after receipt of a request with justification and supporting information, review the facts and advise the Contractor in writing of the Contracting Officer's Representative's decision.

C. The Contractor shall submit each request for a change in the contract completion date to the Contracting Officer's Representative 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 request, a sketch showing all schedule logic revisions, duration changes, and cost changes for work in question and its relationship to other activities on the approved Project Schedule.

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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. 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 beyond those required by the contract are furnished pursuant to request

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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 way connected with organization of Contractor or with manufacturer

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- 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 number, reference to contract drawing number, detail Section Number,

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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.

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

1.1 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

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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

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solve or resolve problems relating to the subject matter, the work, or the project.

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

1.3 REGULATORY REQUIREMENTS:

- A. In addition to the detailed requirements included in the provisions of this contract, comply with 29 CFR 1926, comply with 29 CFR 1910 as incorporated by reference within 29 CFR 1926, comply with ASSE A10.34, and all applicable [federal, state, and local] laws, ordinances, criteria, rules and regulations, 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:

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- 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 ;
- 2) Contingency for severe weather;
- 3) Fire Prevention ;
- 4) Medical Support;

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- 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;

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 Safety // Manager // Officer // Contracting Officer Representative // Government Designated Authority //. Should any severe hazard exposure, i.e. imminent danger, become evident, stop work in the area, secure the area, and develop a plan to remove the exposure and control the hazard. Notify the Contracting Officer within 24 hours of discovery. Eliminate/remove the hazard. In the interim, take all necessary action to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public (as defined by ASSE/SAFE A10.34) and the environment.

1.5 ACTIVITY HAZARD ANALYSES (AHAS):

- A. AHAs are also known as Job Hazard Analyses, Job Safety Analyses, and Activity Safety Analyses. Before beginning each work activity involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or sub-contractor is to perform the work, the Contractor(s) performing that work activity shall prepare an AHA (Example electronic AHA forms can be found on the US Army Corps of Engineers web site)
- B. AHAs shall define the activities being performed and identify the work sequences, the specific anticipated hazards, site conditions, equipment, materials, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level of risk.

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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.
- 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

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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).

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

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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.
- 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 VA COR that individuals have undergone contractor's safety briefing.

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

1.9 INSPECTIONS:

- A. The SSHO shall conduct frequent and regular safety inspections (daily) of the site and each of the subcontractors CPs shall conduct frequent and regular safety inspections (daily) of the their work operations as required by 29 CFR 1926.20(b)(2). Each week, the SSHO shall conduct a formal documented inspection of the entire construction areas with the subcontractors' "Trade Safety and Health CPs" present in their work areas. Coordinate with, and report findings and corrective actions weekly to Contracting Officer'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

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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.

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.

SPEC WRITER NOTE: Include the specifications B - D as work operations would make necessary.

- B. An AHA associated with infection control will be performed by VA personnel in accordance with FGI Guidelines (i.e. Infection Control

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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 //

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- 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.

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- 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.

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- 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.

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

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

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

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

D. Products and Materials:

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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
- E. Before any construction on site begins, all contractor personnel involved in the construction or renovation activity shall be educated and trained in infection prevention measures established by the medical center.
- F. A dust control program will be establish and maintained as part of the contractor's infection preventive measures in accordance with the FGI Guidelines for Design and Construction of Healthcare Facilities. Prior to start of work, prepare a plan detailing project-specific dust protection measures with associated product data, including periodic status reports, and submit to Contracting Officer's Representative for review for compliance with contract requirements in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

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- G. Medical center Infection Control personnel will monitor for airborne disease (e.g. aspergillosis) during construction. A baseline of conditions will be established by the medical center prior to the start of work and periodically during the construction stage to determine impact of construction activities on indoor air quality with safe thresholds established.
- H. In general, the following preventive measures shall be adopted during construction to keep down dust and prevent mold.
1. Contractor shall verify that construction exhaust to exterior is not reintroduced to the medical center through intake vents, or building openings. HEPA filtration is required where the exhaust dust may reenter the medical center.
 2. Exhaust hoses shall be exhausted so that dust is not reintroduced to the medical center.
 3. Adhesive Walk-off/Carpet Walk-off Mats shall be used at all interior transitions from the construction area to occupied medical center area. These mats shall be changed as often as required to maintain clean work areas directly outside construction area at all times.
 4. Vacuum and wet mop all transition areas from construction to the occupied medical center at the end of each workday. Vacuum shall utilize HEPA filtration. Maintain surrounding area frequently. Remove debris as it is created. Transport these outside the construction area in containers with tightly fitting lids.
 5. The contractor shall not haul debris through patient-care areas without prior approval of the VA COR 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.

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6. There shall be no standing water during construction. This includes water in equipment drip pans and open containers within the construction areas. All accidental spills must be cleaned up and dried within 12 hours. Remove and dispose of porous materials that remain damp for more than 72 hours.
7. At completion, remove construction barriers and ceiling protection carefully, outside of normal work hours. Vacuum and clean all surfaces free of dust after the removal.

I. Final Cleanup:

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

J. Exterior Construction

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

1.13 TUBERCULOSIS SCREENING

- A. Contractor shall provide written certification that all contract employees assigned to the work site have had a pre-placement tuberculin screening within 90 days prior to assignment to the worksite and been

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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.

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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.

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.

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- 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 VA COR.
- 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.

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.
- 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

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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.

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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.

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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>

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>

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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. Laboratories engaged in testing of concrete and concrete aggregates shall meet the requirements of ASTM C1077.
- 3. Laboratories engaged in testing of bituminous paving materials shall meet the requirements of ASTM D3666.
- 4. 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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5. 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.
6. Laboratories engaged in non-destructive testing (NDT) shall meet the requirements of ASTM E543 and Appendix W, Section W3 of AISC 341.
7. 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.

E. Test Standards: The Contractor shall include a lump sum allowance of \$2000 for furnishing published standards (ASTM, AASHTO, ACI, ANSI, AWS, ASHRAE, UL, etc.) referred to or specifically referenced which are pertinent to any Sections of these specifications. Furnish one set of standards in single copies or bound volumes to the Contracting Officer's Representative within 60 days. Photocopies are not acceptable. Billings for the standards furnished shall be at the net cost to Testing Laboratory. A preliminary list of test standards, with the estimated costs, shall be submitted to the Contracting Officer's Representative for review before any publications of reference standards are ordered.

PART 2 - PRODUCTS (Not Used)**PART 3 - EXECUTION****3.1 EARTHWORK:**

A. General: The Testing Laboratory shall provide qualified personnel, materials, equipment, and transportation as required to perform the services identified/required herein, within the agreed to schedule and/or time frame. The work to be performed shall be as identified herein and shall include but not be limited to the following:

1. Observe fill and subgrades during proof-rolling to evaluate suitability of surface material to receive fill or base course. Provide recommendations to the Contracting Officer's Representative regarding suitability or unsuitability of areas where proof-rolling was observed. Where unsuitable results are observed, witness

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excavation of unsuitable material and recommend to Contracting Officer's Representative extent of removal and replacement of unsuitable materials and observe proof-rolling of replaced areas until satisfactory results are obtained.

2. Provide full time observation of fill placement and compaction and field density testing in building areas and provide full time observation of fill placement and compaction and field density testing in pavement areas to verify that Testing Compaction:
3. Provide supervised geotechnical technician to inspect excavation, subsurface preparation, and backfill for structural fill.

B. Testing Compaction:

1. Determine maximum density and optimum moisture content for each type of fill, backfill and subgrade material used, in compliance with Geotechnical Engineer recommendations, soils report recommendations, ASTM D698 and/or ASTM D1557.
2. Make field density tests in accordance with the primary testing method following ASTM D2922. Field density tests utilizing ASTM D1556 shall be utilized on a case by case basis only if there are problems with the validity of the results from the primary method due to specific site field conditions. Should the testing laboratory propose these alternative methods, they should provide satisfactory explanation to the Contracting Officer's Representative before the tests are conducted.
 - a. Building Slab Subgrade: At least one test of subgrade for every 185m² (2000 square feet) of building slab, but in no case fewer than three tests. In each compacted fill layer, perform one test for every 185 m² (2000 square feet) of overlaying building slab, but in no case fewer than three tests.
 - b. Foundation Wall Backfill: One test per 30 m (100 feet) of each layer of compacted fill but in no case fewer than two tests.
 - c. Pavement Subgrade: One test for each 335 m² (400 square yards), but in no case fewer than two tests.
 - d. Curb, Gutter, and Sidewalk: One test for each 90 m (300 feet), but in no case fewer than two tests.
 - e. Trenches: One test at maximum 30 m (100 foot) intervals per 1200mm (4 foot) of vertical lift and at changes in required density, but in no case fewer than two tests.
 - f. Footing Subgrade: At least one test for each layer of soil on which footings will be placed. Subsequent verification and approval of each footing subgrade may be based on a visual comparison of each subgrade with related tested subgrade when acceptable to Contracting Officer's Representative. In each compacted fill layer below wall footings, perform one field density test for every 30 m (100 feet) of wall. Verify subgrade is level, all loose or disturbed soils have been removed, and correlate actual soil conditions observed with those indicated by test borings.

C. Testing for Footing Bearing Capacity: Evaluate if suitable bearing capacity material is encountered in footing subgrade.

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D. Testing Materials: Test suitability of on-site and off-site borrow as directed by Contracting Officer's Representative.

3.2 LANDSCAPING:

A. Test topsoil for organic materials, pH, phosphate, potash content, and gradation of particles.

1. Test for organic material by using ASTM D2974.
2. Determine percent of silt, sand, clay, and foreign materials such as rock, roots, and vegetation.

B. Submit laboratory test report of topsoil to Contracting Officer's Representative.

3.3 ASPHALT CONCRETE PAVING:

A. Aggregate Base Course:

1. Determine maximum density and optimum moisture content for aggregate base material in Make a minimum of three field density tests on each day's final compaction on
2. Make a Sample and test aggregate as necessary to insure compliance with specification course in accordance with ASTM D1556.
3. Sample and test aggregate as necessary to insure compliance with specification requirements for gradation, wear, and soundness as specified in the applicable state highway standards and specifications.

B. Asphalt Concrete:

1. Aggregate: Sample and test aggregates in stock pile and hot-bins as necessary to insure compliance with specification requirements for gradation (AASHTO T27), wear (AASHTO T96), and soundness (AASHTO T104).
2. Temperature: Check temperature of each load of asphalt concrete at mixing plant and at site of paving operation.
3. Density: Make a minimum of two field density tests in accordance with ASTM D1188 of asphalt base and surface course for each day's paving operation.

3.4 SITE WORK CONCRETE:

A. Test site work concrete including materials for concrete as required in Article CONCRETE of this section.

3.5 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.

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

B. Field Inspection and Materials Testing:

1. Provide a technician at site of placement at all times to perform concrete sampling and testing.
2. Review the delivery tickets of the ready-mix concrete trucks arriving on-site. Notify the Contractor if the concrete cannot be placed within the specified time limits or if the type of concrete delivered is incorrect. Reject any loads that do not comply with the Specification requirements. Rejected loads are to be removed from the site at the Contractor's expense. Any rejected concrete that is placed will be subject to removal.
3. Take concrete samples at point of placement in accordance with ASTM C172. Mold and cure compression test cylinders in accordance with ASTM C31. Make at least three cylinders for each 40 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.

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8. Notify laboratory technician at batch plant of mix irregularities and request materials and proportioning check.
9. Verify that specified mixing has been accomplished.
10. Environmental Conditions: Determine the temperature per ASTM C1064 for each truckload of concrete during hot weather and cold weather concreting operations:
 - a. When ambient air temperature falls below 4.4 degrees C (40 degrees F), record maximum and minimum air temperatures in each 24 hour period; record air temperature inside protective enclosure; record minimum temperature of surface of hardened concrete.
 - b. When ambient air temperature rises above 29.4 degrees C (85 degrees F), record maximum and minimum air temperature in each 24 hour period; record minimum relative humidity; record maximum wind velocity; record maximum temperature of surface of hardened concrete.
11. Inspect the reinforcing steel placement, including bar size, bar spacing, top and bottom concrete cover, proper tie into the chairs, and grade of steel prior to concrete placement. Submit detailed report of observations.
12. Observe conveying, placement, and consolidation of concrete for conformance to specifications.
13. Observe condition of formed surfaces upon removal of formwork prior to repair of surface defects and observe repair of surface defects.
14. Observe curing procedures for conformance with specifications, record dates of concrete placement, start of preliminary curing, start of final curing, end of curing period.
15. Observe preparations for placement of concrete:
 - a. Inspect handling, conveying, and placing equipment, inspect vibrating and compaction equipment.
 - b. Inspect preparation of construction, expansion, and isolation joints.
16. Observe preparations for protection from hot weather, cold weather, sun, and rain, and preparations for curing.
17. Observe concrete mixing:
 - a. Monitor and record amount of water added at project site.
 - b. Observe minimum and maximum mixing times.
18. Measure concrete flatwork for levelness and flatness as follows:
 - a. Perform Floor Tolerance Measurements 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:

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- 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 C39. For each test series, test one cylinder at 7 days and one cylinder at 28 days. Use remaining cylinder as a spare tested as directed by Contracting Officer's Representative. Compile laboratory test reports as follows: Compressive strength test shall be result of one cylinder, except when one cylinder shows evidence of improper sampling, molding or testing, in which case it shall be discarded and strength of spare cylinder shall be used.
2. Make weight tests of hardened lightweight structural concrete in accordance with ASTM C567.
3. Furnish certified compression test reports (duplicate) to Contracting Officer's Representative. In test report, indicate the following information:
 - a. Cylinder identification number and date cast.
 - b. Specific location at which test samples were taken.
 - c. Type of concrete, slump, and percent air.
 - d. Compressive strength of concrete in MPa (psi).
 - e. Weight of lightweight structural concrete in kg/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.

3.6 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.
- F.

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3.7 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 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.

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- g. Welding Ultrasonic Testing: Test in accordance with ASTM E164 and AWS D1.1 for 100 percent of all full penetration welds, braced and moment frame column splices, and a minimum of 20 percent of all other partial penetration column splices, at random.
 - h. Welding Radiographic Testing: Test in accordance with ASTM E94, and AWS D1.1 for 5 percent of all full penetration welds at random.
 - i. Verify that correction of rejected welds are made in accordance with 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.

3.8 STEEL DECKING:

A. Provide field inspection of welds of metal deck to the supporting steel, and testing services to insure steel decking has been installed in accordance with contract documents and manufacturer's requirements.

B. Qualification of Field Welding: Qualify welding processes and welding

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operators in accordance with "Welder Qualification" procedures of AWS D1.1. Refer to the "Plug Weld Qualification Procedure" in Part 3 "Field Quality Control."

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

3.9 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.

3.10 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.

3.11 TYPE OF TEST:

Approximate Number
of Tests Required

A. Earthwork:

1. Laboratory Compaction Test, Soils:

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[(AASHTO T180)][(AASHTO T99)][(ASTM D1557)][(ASTM D698)]	
Field Density, Soils (AASHTO T191, T205, or T238)	40
Penetration Test, Soils	40
B. Landscaping:	
1. Topsoil Test	6
C. Aggregate Base:	
Laboratory Compaction, [(AASHTO T180)] [] [(ASTM D1557)]	10
Aggregate, Base Course	
Gradation (AASHTO T27)	10
Wear (AASHTO T96)	5
Soundness (AASHTO T104)	5
D. Asphalt Concrete:	
Field Density, (AASHTO T230)[ASTM D1188]	5
Gradation (AASHTO T27)	5
Wear (AASHTO T96)	5
Soundness (AASHTO T104)	5
E. 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__
F. Reinforcing Steel:	
Tensile Test (ASTM A370)	__2__
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)	_____
G. Structural Steel:	
Ultrasonic Testing of Welds (ASTM E164)	__10__
Magnetic Particle Testing of Welds (ASTM E709)	__30__
Radiographic Testing of Welds (ASTM E94)	__4__

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- Shear Connectors _____20__
- H. Sprayed-On Fireproofing:
- Thickness and Density Tests (ASTM E605) _____20__
- I. Inspection:
- Technical Personnel (Man Days) as req'd
- J. 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.

- - - E N D - - -

SECTION 01 56 39
TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies general protection of existing trees and plants that are affected by execution of the work, whether temporary or permanent construction.

1.2 RELATED WORK

- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 00, EARTH MOVING.
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- G. Infectious Control: Section 01 00 00, GENERAL REQUIREMENTS, Article 1.7, INFECTION PREVENTION MEASURES.

1.3 REFERENCED STANDARDS

- A. ASTM F 567-00 Practice for Installation of Chain-Link Fence

1.4 DEFINITIONS

- A. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by a circle concentric with each tree with a radius 1.5 times the diameter of the drip line unless otherwise indicated.

1.5 PROJECT CONDITIONS

- A. Prohibited Practices (following practices are prohibited within protection zones):
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.

6. Excavation or digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 8. Fertilizing protected trees during first year following construction, unless otherwise instructed by arborist.
- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

- A. Protection-Zone Fencing:
1. Portable Chain-Link Fencing: Minimum 2-inch, 0.148-inch-thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized-steel pipe posts; minimum 2-3/8-inch-OD line posts and 2-7/8-inch-OD corner and pull posts, with 1-5/8-inch-OD top and bottom rails. Provide concrete bases for supporting posts.
- B. Protection-Zone Signage:
1. Shop-fabricated, rigid plastic or metal sheet with attachment holes pre-punched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 TREE PROTECTION ZONES

- A. Protection-Zone Fencing:
1. Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people and animals from easily entering protected area. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives or other vehicular circulation.
 2. Posts: Provide concrete base acceptable to the Contracting Officer's Representative.
- B. Protection-Zone Signage:
1. Install protection-zone signage in visibly prominent location in a manner approved by the Contracting Officer's Representative. Install one sign spaced approximately every 20 feet on protection-zone fencing, but no fewer than signs with each facing a different direction.
- C. Maintenance of Protection Zones:

1. Maintain protection zones free of weeds and trash.
2. Maintain protection-zone fencing and signage in good conditions as acceptable to Contracting Officer's Representative and remove when construction operations are complete and equipment has been removed from site. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

3.2 EXCAVATION

A. General:

1. Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Division 31 Section 'Earth Moving.'

B. Trenching near Trees:

1. Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut as required for root pruning.

C. Roots:

1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction and as required for root pruning.
2. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

3.3 REGRADING

A. Lowering Grade:

1. Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Lowering Grade within Protection Zone:

1. Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist unless otherwise indicated.
2. Root Pruning: Prune tree roots exposed by lowering the grade. Do not cut main lateral roots or tap roots; cut only smaller roots. Cut roots as required for root pruning.

C. Raising Grade:

1. Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

D. Minor Fill within Protection Zone:

1. Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

3.4 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal:

1. Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off as specified in Section 31 20 00, "Earthwork", paragraph 3.5.

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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 Land Resources: Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, top soil, and land forms without permission from the Contracting Officer's Representative. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
- 1. Work Area Limits: Prior to any construction, mark the areas that require work to be performed under this contract. Mark or fence isolated areas within the general work area that are to be saved and protected. Protect monuments, works of art, and markers before construction operations begin. Convey to all personnel the purpose of marking and protecting all necessary objects.
 - 2. Protection of Landscape: Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using any other approved techniques.
 - a. Box and protect from damage existing trees and shrubs to remain on the construction site.
 - b. Immediately repair all damage to existing trees and shrubs by trimming, cleaning, and painting with antiseptic tree paint.

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- c. Do not store building materials or perform construction activities closer to existing trees or shrubs than the farthest extension of their limbs.
3. Reduction of Exposure of Unprotected Erodible Soils: Plan and conduct earthwork to minimize the duration of exposure of unprotected soils. Clear areas in reasonably sized increments only as needed to use. Form earthwork to final grade as shown. Immediately protect side slopes and back slopes upon completion of rough grading.
4. Temporary Protection of Disturbed Areas: Construct diversion ditches, benches, and berms to retard and divert runoff from the construction site to protected drainage areas approved under paragraph 208 of the Clean Water Act.
 - a. Sediment Basins: Trap sediment from construction areas in temporary or permanent sediment basins that accommodate the runoff of a local 100 year (design year) storm. After each storm, pump the basins dry and remove the accumulated sediment. Control overflow/drainage with paved weirs or by vertical overflow pipes, draining from the surface.
 - b. Reuse or conserve the collected topsoil sediment as directed by the Contracting Officer's Representative. Topsoil use and requirements are specified in Section 31 20 00, EARTH MOVING.
 - c. Institute effluent quality monitoring programs as required by Federal, State, and local environmental agencies.
5. Erosion and Sedimentation Control Devices: The erosion and sediment controls selected and maintained by the Contractor shall be such that water quality standards are not violated as a result of the Contractor's activities. Construct or install all temporary and permanent erosion and sedimentation control features as required. Maintain temporary erosion and sediment control measures such as berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
6. Manage borrow areas on Government property to minimize erosion and to prevent sediment from entering nearby water courses or lakes.
7. Manage and control spoil areas on Government property to limit spoil to areas and prevent erosion of soil or sediment from entering nearby water courses or lakes.
8. Protect adjacent areas from despoilment by temporary excavations and embankments.
9. Handle and dispose of solid wastes in such a manner that will prevent contamination of the environment. Place solid wastes (excluding clearing debris) in containers that are emptied on a regular schedule. Transport all solid waste off Government property and dispose of waste in compliance with Federal, State, and local requirements.
10. Store chemical waste away from the work areas in corrosion resistant containers and dispose of waste in accordance with Federal, State, and local regulations.

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11. Handle discarded materials other than those included in the solid waste category as directed by the Contracting Officer's Representative.
- C. Protection of Water Resources: Keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters and sewer systems. Implement management techniques to control water pollution by the listed construction activities that are included in this contract.
1. Washing and Curing Water: Do not allow wastewater directly derived from construction activities to enter water areas. Collect and place wastewater in retention ponds allowing the suspended material to settle, the pollutants to separate, or the water to evaporate.
 2. Control movement of materials and equipment at stream crossings during construction to prevent violation of water pollution control standards of the Federal, State, or local government.
 3. Monitor water areas affected by construction.
- D. 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.
- E. Protection of Air Resources: Keep construction activities under surveillance, management, and control to minimize pollution of air resources. Burning is not permitted on the job site. Keep activities, equipment, processes, and work operated or performed, in strict accordance with the State of 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.

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F. Reduction of Noise: Minimize noise using every action possible. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer'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 8:00 a.m. and 6:00 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
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

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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.

- G. Restoration of Damaged Property: If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the Contractor shall restore the damaged property to a condition equal to that existing before the damage at no additional cost to the Government. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
- H. Final Clean-up: On completion of project and after removal of all debris, rubbish, and temporary construction, Contractor shall leave the construction area in a clean condition satisfactory to the Contracting Officer'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.
- B. Clearly identify containers, bins and storage areas so that recyclable

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materials are separated from trash and can be transported to respective recycling facility for processing.

- C. Hazardous wastes shall be separated, stored, disposed of according to local, state, federal regulations.

3.2 DISPOSAL

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

3.3 REPORT

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

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SECTION 01 81 11**SUSTAINABLE DESIGN REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

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

1.2 OBJECTIVES

- A. To maximize resource efficiency and reduce the environmental impacts of construction and operation, the Contractor during the construction phase of this project shall implement the following procedures:
1. Select products that minimize consumption of energy, water and non-renewable resources, while minimizing the amounts of pollution resulting from the production and employment of building technologies. It is the intent of this project to conform with EPA's Five Guiding Principles on environmentally preferable purchasing. The five principles are:
 - a. Include environmental considerations as part of the normal purchasing process.
 - b. Emphasize pollution prevention early in the purchasing process.
 - c. Examine multiple environmental attributes throughout a product's or service's life cycle.
 - d. Compare relevant environmental impacts when selecting products and services.
 - e. Collect and base purchasing decisions on accurate and meaningful information about environmental performance.
 2. Control sources for potential Indoor Air Quality (IAQ) pollutants by controlled selection of materials and processes used in project construction in order to attain superior IAQ.
 3. Products and processes that achieve the above objectives to the extent currently possible and practical have been selected and included in these Construction Documents. The Contractor is

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responsible to maintain and support these objectives in developing means and methods for performing the work of this Contract and in proposing product substitutions and/or changes to specified processes.

4. Use building practices that insure construction debris and particulates do not contaminate or enter duct work prior to system startup and turn over.

1.3 RELATED DOCUMENTS

- A. Section 01 74 19 CONSTRUCTION WASTE MANAGEMENT

1.4 DEFINITIONS

- A. Agrifiber Products: Composite panel products derived from agricultural fiber
- B. Biobased Product: As defined in the 2002 Farm Bill, a product determined by the Secretary to be a commercial or industrial product (other than food or feed) that is composed, in whole or in significant part, of biological products or renewable domestic agricultural materials (including plant, animal, and marine materials) or forestry materials
- C. Biobased Content: The weight of the biobased material divided by the total weight of the product and expressed as a percentage by weight
- D. Certificates of Chain-of-Custody: Certificates signed by manufacturers certifying that wood used to make products has been tracked through its extraction and fabrication to ensure that it was obtained from forests certified by a specified certification program
- E. Composite Wood: A product consisting of wood fiber or other plant particles bonded together by a resin or binder
- F. Construction and Demolition Waste: Includes solid wastes, such as building materials, packaging, rubbish, debris, and rubble resulting from construction, remodeling, repair and demolition operations. A construction waste management plan is to be provided by the Contractor as defined in Section 01 74 19.
- G. Third Party Certification: Certification of levels of environmental achievement by nationally recognized sustainability rating system.

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- H. Light Pollution: Light that extends beyond its source such that the additional light is wasted in an unwanted area or in an area where it inhibits view of the night sky
- I. Recycled Content Materials: Products that contain pre-consumer or post-consumer materials as all or part of their feedstock
- J. Post-Consumer Recycled Content: The percentage by weight of constituent materials that have been recovered or otherwise diverted from the solid-waste stream after consumer use
- K. Pre-Consumer Recycled Content: Materials that have been recovered or otherwise diverted from the solid-waste stream during the manufacturing process. Pre-consumer content must be material that would not have otherwise entered the waste stream as per Section 5 of the FTC Act, Part 260 "Guidelines for the Use of Environmental Marketing Claims": www.ftc.gov/bcp/grnrule/guides980427
- L. Regional Materials: Materials that are extracted, harvested, recovered, and manufactured within a radius of 250 miles (400 km) from the Project site
- M. Salvaged or Reused Materials: Materials extracted from existing buildings in order to be reused in other buildings without being manufactured
- N. Sealant: Any material that fills and seals gaps between other materials
- O. Type 1 Finishes: Materials and finishes which have a potential for short-term levels of off gassing from chemicals inherent in their manufacturing process, or which are applied in a form requiring vehicles or carriers for spreading which release a high level of particulate matter in the process of installation and/or curing.
- P. Type 2 Finishes: "Fuzzy" materials and finishes which are woven, fibrous, or porous in nature and tend to adsorb chemicals offgas
- Q. Volatile Organic Compounds (VOCs): Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions. Compounds that have negligible photochemical reactivity, listed in EPA 40 CFR 51.100(s), are also excluded from this regulatory definition.

1.5 SUBMITTALS**A. Sustainable Design Submittals:**

1. Alternative Transportation: Provide manufacturer's cut sheets for all bike racks installed on site, including the total number of bicycle storage slots provided. Also, provide manufacturer's cut sheets for any alternative-fuel refueling stations installed on site, including fueling capacity information for an 8-hour period.
2. Heat Island Effect:
 - a. Site Paving: Provide manufacturer's cut sheets for all impervious paving materials, highlighting the Solar Reflectance Index (SRI) of the material. Also, provide cut sheets for all pervious paving materials.
 - b. Roofing Materials: Submittals for roofing materials must include manufacturer's cut sheets or product data highlighting the Solar Reflectance Index (SRI) of the material.
3. Exterior Lighting Fixtures: Submittals must include cut sheets with manufacturer's data on initial fixture lumens above 90° from nadir for all exterior lighting fixtures, and, for parking lot lighting, verification that the fixtures are classified by the IESNA as "full cutoff" (FCO); OR provide documentation that exterior luminaires are IDA-Approved as Dark-Sky Friendly by the International Dark Sky Association (IDA) Fixture Seal of Approval Program.
4. Irrigation Systems: Provide manufacturer's cut sheets for all permanent landscape irrigation system components and for any rainwater harvesting system components, such as cisterns.
5. Water Conserving Fixtures: Submittals must include manufacturer's cut sheets for all water-consuming plumbing fixtures and fittings (toilets, urinals, faucets, showerheads, etc.) highlighting maximum flow rates and/or flush rates. Include cut sheets for any automatic faucet-control devices.
6. Process Water Use: Provide manufacturer's cut sheets for all water-consuming commercial equipment (clothes washers, dishwashers, ice machines, etc.), highlighting water consumption performance. Include manufacturer's cut sheets or product data for any cooling towers,

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- highlighting water consumption estimates, water use reduction measures, and corrosion inhibitors.
7. Elimination of CFCs AND HCFCs: Provide manufacturer's cut sheets for all cooling equipment with manufacturer's product data, highlighting refrigerants; provide manufacturer's cut sheets for all fire-suppression equipment, highlighting fire-suppression agents; provide manufacturer's cut-sheets for all polystyrene insulation (XPS) and closed-cell spray foam polyurethane insulation, highlighting the blowing agent(s).
 8. Appliances and Equipment: Provide copies of manufacturer's product data for all Energy Star eligible equipment and appliances, including office equipment, computers and printers, electronics, and commercial food service equipment (excluding HVAC and lighting components), verifying compliance with EPA's Energy Star program.
 9. On-Site Renewable Energy Systems: Provide cut sheets and manufacturer's product data for all on-site renewable energy generating components and equipment, including documentation of output capacity.
 10. Measurement and Verification Systems: Provide cut sheets and manufacturer's product data for all controls systems, highlighting electrical metering and trending capability components.
 11. Salvaged or Reused Materials: Provide documentation that lists each salvaged or reused material, the source or vendor of the material, the purchase price, and the replacement cost if greater than the purchase price.
 12. Recycled Content: Submittals for all materials with recycled content (excluding MEP systems equipment and components) must include the following documentation: Manufacturer's product data, product literature, or a letter from the manufacturer verifying the percentage of post-consumer and pre-consumer recycled content (by weight) of each material or product
 - a. An electronic spreadsheet that tabulates the Project's total materials cost and combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value) expressed as a

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percentage of total materials cost. This spreadsheet shall be submitted every third month with the Contractor's Certificate and Application for Payment. It should indicate, on an ongoing basis, line items for each material, including cost, pre-consumer recycled content, post-consumer recycled content, and combined recycled content value.

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

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14. Outdoor Air Delivery Monitoring: Provide manufacturer's cut sheets highlighting the installed carbon dioxide monitoring system components and sequence of controls shop drawing documentation, including CO2 differential set-points and alarm capabilities.
15. Interior Adhesives and Sealants: Submittals for all field-applied adhesives and sealants, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content.
 - a. Provide manufacturers' documentation verifying all adhesives used to apply laminates, whether shop-applied or field-applied, contain no urea-formaldehyde.
16. Interior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on indoor air, must include manufacturer's MSDSs or other Product Data highlighting VOC content
17. Exterior Paints and Coatings: Submittals for all field-applied paints and coatings, which have a potential impact on ambient air quality, must include manufacturer's MSDSs or other manufacturer's Product Data highlighting VOC content.
18. Floorcoverings:
 - a. Carpet Systems: Submittals for all carpet must include the following:
 - 1) A copy of an assessment from the Building for Environmental and Economic Sustainability (BEES) software model, either Version 3.0 or 4.0, with parameters of the model set as described by this specification section.
 - 2) Manufacturer's product data verifying that all carpet systems meet or exceed the testing and product requirements of the Carpet and Rug Institute Green Label Plus program.
 - b. Engineered Wood Flooring: Submittals for all engineered wood flooring must include manufacturer's product data verifying certification under either the Greenguard or FloorScore indoor emissions testing program.

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19. Composite Wood and Agrifiber Binders: Submittals for all composite wood and agrifiber products (including but not limited to particleboard, wheatboard, strawboard, agriboard products, engineered wood components, solid-core wood doors, OSB, MDF, and plywood products) must include manufacturer's product data verifying that these products contain no urea-formaldehyde resins.
20. Systems Furniture and Seating: Provide manufacturer's product data verifying that all systems furniture and seating products meet the requirements of one of the following:
 - a. Greenguard certification
 - b. SCS Indoor Advantage certification
 - c. SCS Indoor Advantage Gold certification
 - d. BIFMA Standard X7.1-2005, as tested to BIFMA method M7.1-2005 and as verified by an independent laboratory
 - d. Calculated indoor air concentration limits for furniture systems and seating determined by the U.S. EPA's Environmental Technology Verification Large Chamber Test Protocol for Measuring Emissions of VOCs and Aldehydes (September 1999) testing protocol as conducted in an independent air quality testing laboratory
21. Entryway Systems: Provide manufacturer's cut sheets for all walk-off systems installed to capture particulates, including permanently installed grates, grilles, slotted systems, direct glue-down walk-off mats, and non-permanent roll-out mats.
22. Air Filtration: Provide manufacturer's cut sheets and product data highlighting the following:
 - a. Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs) per ASHRAE HVAC Design Manual for Hospitals and Clinics.
 - b. Minimum Efficiency Reporting Value (MERV) for filtration media installed at return air grilles during construction if permanently installed AHUs are used during construction. See above for requirements
23. Mercury in Lighting: Provide manufacturer's cut sheets or product data for all fluorescent or HID lamps highlighting mercury content.

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24. Lighting Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all lighting controls systems components.
 25. Thermal Comfort Controls: Provide manufacturer's cut sheets and shop drawing documentation highlighting all thermal comfort-control systems components.
 26. Blended Cement: It is the intent of this specification to reduce CO₂ emissions and other environmentally detrimental effects resulting from the production of portland cement by requiring that all concrete mixes, in aggregate, utilize blended cement mixes to displace portland cement as specified in Section 03 30 00, CONCRETE typically included in conventional construction. Provide the following submittals:
 - a. Copies of concrete design mixes for all installed concrete
 - b. Copies of typical regional baseline concrete design mixes for all compressive strengths used on the Project
 - c. Quantities in cubic yards of each installed concrete mix
 27. Gypsum Wall Board: Provide manufacturer's cut sheets or product data verifying that all gypsum wallboard products are moisture and mold-resistant.
 28. Fiberglass Insulation: Provide manufacturer's cut sheets or product data verifying that fiberglass batt insulation contains no urea-formaldehyde.
 29. Duct Acoustical Insulation: Provide manufacturer's cut sheets or product data verifying that mechanical sound insulation materials in air distribution ducts consists of an impervious, non-porous coatings that prevent dust from accumulating in the insulating materials.
 30. Green Housekeeping: Provide documentation that all cleaning products and janitorial paper products meet the VOC limits and content requirements of this specification section.
- B. Project Materials Cost Data: Provide a spreadsheet in an electronic file indicating the total cost for the Project and the total cost of building materials used for the Project, as follows:

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1. Not more than 60 days after the Preconstruction Meeting, the General Contractor shall provide to the VA COR and Architect a preliminary schedule of materials costs for all materials used for the Project organized by specification section. Exclude labor costs and all mechanical, electrical, and plumbing (MEP) systems materials and labor costs. Include the following:
 - a. Identify each reused or salvaged material, its cost, and its replacement value.
 - b. Identify each recycled-content material, its post-consumer and pre-consumer recycled content as a percentage the product's weight, its cost, its combined recycled content value (defined as the sum of the post-consumer recycled content value plus one-half of the pre-consumer recycled content value), and the total combined recycled content value for all materials as a percentage of total materials costs.
 - c. Identify each regional material, its cost, its manufacturing location, the distance of this location from the Project site, the source location for each raw material component of the material, the distance of these extraction locations from the Project site, and the total value of regional materials as a percentage of total materials costs.
 - d. Identify each biobased material, its source, its cost, and the total value of biobased materials as a percentage of total materials costs. Also provide the total value of rapidly renewable materials (materials made from plants that are harvested in less than a 10-year cycle) as a percentage of total materials costs.
 - e. Identify each wood-based material, its cost, the total wood-based materials cost, each FSC Certified wood material, its cost, and the total value of Certified wood as a percentage of total wood-based materials costs.
 2. Provide final versions of the above spreadsheets to the Owner and Architect not more than 14 days after Substantial Completion.
- C. Construction Waste Management: See Section 01 74 19 "Construction Waste Management" for submittal requirements.

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D. Construction Indoor Air Quality (IAQ) Management: Submittals must include the following:

1. Not more than 30 days after the Preconstruction Meeting, prepare and submit for the Architect and VA COR's approval, an electronic copy of the draft Construction IAQ Management Plan in an electronic file including, but not limited to, descriptions of the following:
2. Instruction procedures for meeting or exceeding the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings Under Construction, 1995, Chapter 3, including procedures for HVAC Protection, Source Control, Pathway Interruption, Housekeeping, and Scheduling
 - a. Instruction procedures for protecting absorptive materials stored on-site or installed from moisture damage
 - b. Schedule of submission to Architect of photographs of on-site construction IAQ management measures such as protection of ducts and on-site stored oil installed absorptive materials
 - c. Instruction procedures if air handlers must be used during construction, including a description of filtration media to be used at each return air grille
 - d. Instruction procedure for replacing all air-filtration media immediately prior to occupancy after completion of construction, including a description of filtration media to be used at each air handling or air supply unit
3. Not more than 30 days following receipt of the approved draft CIAQMP, submit an electronic copy of the approved CIAQMP in an electronic file, along with the following:
 - a. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for all filtration media to be installed at return air grilles during construction if permanently installed AHUs are used during construction.
 - b. Manufacturer's cut sheets and product data highlighting the Minimum Efficiency Reporting Value (MERV) for filtration media in all air handling units (AHUs).

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4. Not more than 14 days after Substantial Completion provide the following:

- a. Documentation verifying required replacement of air filtration media in all air handling units (AHUs) after the completion of construction and prior to occupancy and, if applicable, required installation of filtration during construction.
- b. Minimum of 18 Construction photographs: Six photographs taken on three different occasions during construction of the SMACNA approaches employed, along with a brief description of each approach, documenting implementation of the IAQ management measures, such as protection of ducts and on-site stored or installed absorptive materials.
- c. A copy of the report from testing and inspecting agency documenting the results of IAQ testing, demonstrating conformance with IAQ testing procedures and requirements defined in Section 01 81 09 "Testing for Indoor Air Quality."

F. Sustainable Design Progress Reports: Concurrent with each Application for Payment, submit reports for the following:

1. Construction Waste Management: Waste reduction progress reports and logs complying with the requirements of Section 01 74 19 "Construction Waste Management."
2. Construction IAQ Management: See details below under Section 3.2 Construction Indoor Air Quality Management for Construction IAQ management progress report requirements.

1.6 QUALITY ASSURANCE

A. Preconstruction Meeting: After award of Contract and prior to the commencement of the Work, schedule and conduct meeting with VA COR, Architect, and all Subcontractors to discuss the Construction Waste Management Plan, the required Construction Indoor Air Quality (IAQ) Management Plan, and all other Sustainable Design Requirements. The purpose of this meeting is to develop a mutual understanding of the Project's Sustainable Design Requirements and coordination of the Contractor's management of these requirements with the Contracting Officer and the Construction Quality Manager.

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

PART 2 - PRODUCTS**2.1 PRODUCT ENVIRONMENTAL REQUIREMENTS**

- A. Site Clearing: Topsoil shall be provided by the Contractor from on-site material which has been stockpiled for reuse. Off-site borrow should only be used when on-site sources are exhausted. Chip and/or compost on site all vegetated material identified for removal.
- B. Do not burn rubbish, organic matter, etc. or any material on the site. Dispose of legally in accordance with Specifications Sections 01 74 19.
- C. Roofing Materials: All roofing systems, other than vegetated roof systems, must comply with the following requirements:
1. Low-Sloped roofing less than or equal to 2:12 slope must have an SRI of at least 78.
 2. Steep-Sloped roofing greater than 2:12 slope must have an SRI of at least 29.
 3. Roofing Materials: Light-colored, reflective, and high-emissivity roofing helps to reduce localized heat build-up from roof surfaces that contribute to the urban heat island effect.
- D. Exterior Lighting Fixtures:
1. All exterior luminaires must emit 0% of the total initial designed fixture lumens at an angle above 90° from nadir and/or meet the requirements of the Dark Sky certification program.
 2. Exterior lighting cannot exceed 80% of the lighting power densities defined by ASHRAE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments.
 3. No lighting of building facades or landscape features is permitted.
- E. Herbicides and Pest Control: Herbicides shall not be permitted, and pest control measures shall utilize EPA-registered biopesticides only.
- F. Landscape Irrigation: Use water-efficient landscape and irrigation strategies, including water reuse and recycling, to reduce outdoor potable water consumption by a minimum of 50 percent over that consumed by conventional means (plant species and plant densities).

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G. Water-Conserving Fixtures: Plumbing fixtures and fittings shall use in aggregate at least 20% less water than the water use baseline calculated for the building after meeting the Energy Policy Act of 1992 fixture performance requirements. Flow and flush rates shall not exceed the following:

1. Toilets: no more than 1.3 gallons per flush, otherwise be dual flush 1.6/0.8 gallons per flush, and have documented bowl evacuation capability per MaP testing of at least 400 grams
2. Urinals: Waterless or Water sense rated with no more than 0.5 gallons per flush.
3. Lavatory Faucets: 0.5 gpm with automatic faucet controls
4. Kitchen Sink Lavatories: 2.2 gpm
5. Showerheads: no more than 1.5gpm

H. Process Water Use: Employ strategies that in aggregate result in 20% less water use than the process water use baseline for the building after meeting the commercial equipment and HVAC performance requirements as listed in the Table below. For equipment not addressed by EPACT 2005 or the list below, additional equipment performance requirements may be proposed provided documentation supporting the proposed benchmark or industry standard is submitted.

1. Clothes Washer: 7.5 gallons/cubic foot/cycle
2. Dishwasher with Racks: 1.0 gallons/rack
3. Ice Machine: 20 gallons/100 pounds ice for machines making over 175 pounds of ice per day; 30 gallons/100 pounds ice for machines making less than 175 ice per day. Avoid water-cooled machines.
4. Food Steamer: 2 gallons/hour. Use only boilerless steamers.
5. Pre-Rinse Spray Valves: 1.4 gallons/minute
6. Kitchen Pot-Washing Sinks: 2.2 gallons/minute
7. Cooling Towers: 2.3 gallons/ton-hr. water loss

I. Elimination of CFCs AND HCFCs:

1. Ozone Protection and Greenhouse Gas Reduction: Base building cooling equipment shall contain no refrigerants other than the following: HCFC-123, HFC-134a, HFC-245fa, HFC-407c, or HFC 410a.
2. Fire suppression systems may not contain ozone-depleting substances such as halon 1301 and 1211.

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

J. Appliances and Equipment: All materials and equipment being installed that falls under the Energy Star or FEMP programs must be Energy Star or FEMP-rated. Eligible equipment includes refrigerators, motors, laundry equipment, office equipment and more. Refer to each program's website for a complete list.

K. HVAC Distribution Efficiency:

1. All duct systems shall be constructed of aluminum, stainless steel or galvanized sheet metal, as deemed appropriate based on the application requirements. No fiberglass duct board shall be permitted.
2. All medium- and high-pressure ductwork systems shall be pressure-tested in accordance with the current SMACNA standards.
3. All ductwork shall be externally insulated. No interior duct liner shall be permitted.
4. Where possible, all air terminal connections shall be hard-connected with sheet metal ductwork. If flexible ductwork is used, no flexible duct extension shall be more than six feet in length.
5. All HVAC equipment shall be isolated from the ductwork system with flexible duct connectors to minimize the transmittance of vibration.
6. All supply and return air branch ducts shall include the appropriate style of volume damper. Air terminal devices such as grilles, registers, and diffusers shall be balanced at duct branch dampers, not at terminal face.

L. Measurement and Verification: Install controls and monitoring devices as required by MEP divisions order to comply with International Performance Measurement & Verification Protocol (IPMVP), Volume III: Concepts and Options for Determining Energy Savings in New Construction, April 2003, Option D.

1. The IPMVP provides guidance on situation-appropriate application of measurement and verification strategies.

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

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

N. Recycled Content of Materials:

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

Category	Minimum Recycled Content
Compost/mulch	100% post-consumer
Asphaltic Concrete Paving	25% post-consumer
Cast-in-Place Concrete	6% pre-consumer
CMU: Gray Block	20% pre-consumer
Steel Reinforcing Bars	90% combined

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Structural Steel Shapes	90% combined
Steel Joists	75% combined
Steel Deck	75% combined
Steel Fabrications	60% combined
Steel Studs	30% combined
Steel Roofing	30% post-consumer
Aluminum Fabrications	35% combined
Rigid Insulation	20% pre-consumer
Batt insulation	30% combined

O. Biobased Content:

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

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SECTION 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 22, Division 23, Division 26, Division 27 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 22, Division 23, Division 26, Division 27 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 22 08 00 COMMISSIONING OF PLUMBING SYSTEMS.
- E. Section 23 08 00 COMMISSIONING OF HVAC SYSTEMS.
- F. Section 26 08 00 COMMISSIONING OF ELECTRICAL SYSTEMS.
- G. Section 27 08 00 COMMISSIONING OF COMMUNICATIONS SYSTEMS.
- H. 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

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

List of Acronyms	
Acronym	Meaning
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

Expand Emergency Department Services

Systems To Be Commissioned	
System	Description
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
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)

Expand Emergency Department Services

Systems To Be Commissioned	
System	Description
Low-Voltage Distribution System	Normal power distribution system, Life-safety power distribution system, critical power distribution system, equipment power distribution system, switchboards, distribution panels, panelboards, verify breaker testing results (injection current, etc)
Lighting & Lighting Control Systems	Emergency lighting, occupancy sensors, lighting control systems, architectural dimming systems, 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

Systems To Be Commissioned	
System	Description
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.

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- L. Compile test data, inspection reports, and certificates and include them in the systems manual and commissioning report.
 - M. Review and comment on operation and maintenance (O&M) documentation and systems manual outline for compliance with the Contract Documents. Operation and maintenance documentation requirements are specified in Paragraph 1.25, Section 01 00 00 GENERAL REQUIREMENTS.
 - N. Review operation and maintenance training program developed by the Contractor. Verify training plans provide qualified instructors to conduct operation and maintenance training.
 - O. Prepare commissioning Field Observation Reports.
 - P. Prepare the Final Commissioning Report.
 - Q. Return to the site at 10 months into the 12 month warranty period and review with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal Systems Functional Performance Testing. Also interview facility staff and identify problems or concerns they have operating the building as originally intended. Make suggestions for improvements and for recording these changes in the O&M manuals. Identify areas that may come under warranty or under the original construction contract. Assist facility staff in developing reports, documents and requests for services to remedy outstanding problems.
 - R. Assemble the final commissioning documentation, including the Final Commissioning Report and Addendum to the Final Commissioning Report.

1.12 COMMISSIONING DOCUMENTATION

- A. Commissioning Plan: A document, prepared by Commissioning Agent, that outlines the schedule, allocation of resources, and documentation requirements of the commissioning process, and shall include, but is not limited, to the following:
 - 1. Plan for delivery and review of submittals, systems manuals, and other documents and reports. Identification of the relationship of these documents to other functions and a detailed description of submittals that are required to support the commissioning processes. Submittal dates shall include the latest date approved submittals must be received without adversely affecting commissioning plan.

2. Description of the organization, layout, and content of commissioning documentation (including systems manual) and a detailed description of documents to be provided along with identification of responsible parties.
 3. Identification of systems and equipment to be commissioned.
 4. Schedule of Commissioning Coordination meetings.
 5. Identification of items that must be completed before the next operation can proceed.
 6. Description of responsibilities of commissioning team members.
 7. Description of observations to be made.
 8. Description of requirements for operation and maintenance training.
 9. Schedule for commissioning activities with dates coordinated with overall construction schedule.
 10. Process and schedule for documenting changes on a continuous basis to appear in Project Record Documents.
 11. Process and schedule for completing prestart and startup checklists for systems, subsystems, and equipment to be verified and tested.
 12. Preliminary Systems Functional Performance Test procedures.
- B. Systems Functional Performance Test Procedures: The Commissioning Agent will develop Systems Functional Performance Test Procedures for each system to be commissioned, including subsystems, or equipment and interfaces or interlocks with other systems. Systems Functional Performance Test Procedures will include a separate entry, with space for comments, for each item to be tested. Preliminary Systems Functional Performance Test Procedures will be provided to the VA, Architect/Engineer, and Contractor for review and comment. The Systems Performance Test Procedure will include test procedures for each mode of operation and provide space to indicate whether the mode under test responded as required. Each System Functional Performance Test procedure, regardless of system, subsystem, or equipment being tested, shall include, but not be limited to, the following:
1. Name and identification code of tested system.
 2. Test number.
 3. Time and date of test.
 4. Indication of whether the record is for a first test or retest following correction of a problem or issue.

5. Dated signatures of the person performing test and of the witness, if applicable.
 6. Individuals present for test.
 7. Observations and Issues.
 8. Issue number, if any, generated as the result of test.
- C. Pre-Functional Checklists: The Commissioning Agent will prepare Pre-Functional Checklists. Pre-Functional Checklists shall be completed and signed by the Contractor, verifying that systems, subsystems, equipment, and associated controls are ready for testing. The Commissioning Agent will spot check Pre-Functional Checklists to verify accuracy and readiness for testing. Inaccurate or incomplete Pre-Functional Checklists shall be returned to the Contractor for correction and resubmission.
- D. Test and Inspection Reports: The Commissioning Agent will record test data, observations, and measurements on Systems Functional Performance Test Procedure. The report will also include recommendation for system acceptance or non-acceptance. Photographs, forms, and other means appropriate for the application shall be included with data. Commissioning Agent Will compile test and inspection reports and test and inspection certificates and include them in systems manual and commissioning report.
- E. Corrective Action Documents: The Commissioning Agent will document corrective action taken for systems and equipment that fail tests. The documentation will include any required modifications to systems and equipment and/or revisions to test procedures, if any. The Commissioning Agent will witness and document any retesting of systems and/or equipment requiring corrective action and document retest results.
- F. Commissioning Issues Log: The Commissioning Agent will prepare and maintain Commissioning Issues Log that describes Commissioning Issues and Commissioning Observations that are identified during the Commissioning process. These observations and issues include, but are not limited to, those that are at variance with the Contract Documents. The Commissioning Issues Log will identify and track issues as they are encountered, the party responsible for resolution, progress toward resolution, and document how the issue was resolved. The Master

Commissioning Issues Log will also track the status of unresolved issues.

1. Creating 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.
 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.
 5. Commissioning Activities Schedule: Identification of Commissioning Activities, including Systems Functional Testing, the expected duration and predecessors for the activity.
 6. Pre-Functional Checklists: Preliminary Pre-Functional Checklists for equipment, components, subsystems, and systems to be commissioned. These Preliminary Pre-Functional Checklists provide guidance on the level of detailed information the Contractor shall include on the final submission.
 7. Systems Functional Performance Test Procedures: Preliminary step-by-step System Functional Performance Test Procedures to be used during Systems Functional Performance Testing. These Preliminary Systems Functional Performance procedures provide information on the level of testing rigor, and the level of Contractor support required during performance of system's testing.
- B. Final Commissioning Plan Submittal: Based on the Final Construction Documents and the Contractor's project team, the Commissioning Agent will prepare the Final Commissioning Plan as described in this section. The Commissioning Agent will submit three hard copies and three sets of electronic files of Final Commissioning Plan. The Contractor shall review the Commissioning Plan and provide any comments to the VA. The Commissioning Agent will incorporate review comments into the Final Commissioning Plan as directed by the VA.
- C. Systems Functional Performance Test Procedure: The Commissioning Agent will submit preliminary Systems Functional Performance Test Procedures to the Contractor, and the VA for review and comment. The Contractor

shall return review comments to the VA and the Commissioning Agent.

The VA will also return review comments to the Commissioning Agent. The Commissioning Agent will incorporate review comments into the Final Systems Functional Test Procedures to be used in Systems Functional Performance Testing.

- D. Pre-Functional Checklists: The Commissioning Agent will submit Pre-Functional Checklists to be completed by the Contractor.
- E. Test and Inspection Reports: The Commissioning Agent will submit test and inspection reports to the VA with copies to the Contractor and the Architect/Engineer.
- F. Corrective Action Documents: The Commissioning Agent will submit corrective action documents to the VA 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.
 - 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.

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- 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 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.
 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 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.

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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.

Expand Emergency Department Services

- 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

----- END -----

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

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

1.2 RELATED WORK:

- A. Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT: Procedures and requirements for managing and disposing construction and demolition waste.
- B. Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS: Sustainable design requirements including submittal requirements.
- A. Demolition and removal of roads, walks, curbs, and on-grade slabs outside buildings to be demolished: Section 31 20 00, EARTHWORK.
- B. Safety Requirements: GENERAL CONDITIONS Article, ACCIDENT PREVENTION.
- C. Disconnecting utility services prior to demolition: Section 01 00 00, GENERAL REQUIREMENTS.
- D. Reserved items that are to remain the property of the Government: Section 01 00 00, GENERAL REQUIREMENTS.
- E. Environmental Protection: Section 01 57 19, TEMPORARY ENVIRONMENTAL CONTROLS.
- F. Construction Waste Management: Section 017419 CONSTRUCTION WASTE MANAGEMENT.
- G. 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.

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- C. Maintain fences, barricades, lights, and other similar items around exposed excavations until such excavations have been completely filled.
- D. Provide enclosed dust chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.
- E. Prevent spread of flying particles and dust. Sprinkle rubbish and debris with water to keep dust to a minimum. Do not use water if it results in hazardous or objectionable condition such as, but not limited to; ice, flooding, or pollution. Vacuum and dust the work area daily.
- F. In addition to previously listed fire and safety rules to be observed in performance of work, include following:
 - 1. No wall or part of wall shall be permitted to fall outwardly from structures.
 - 2. Maintain at least one stairway in each structure in usable condition to highest remaining floor. Keep stairway free of obstructions and debris until that level of structure has been removed.
 - 3. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. Instruct all possible users in use of fire extinguishers.
 - 4. Keep hydrants clear and accessible at all times. Prohibit debris from accumulating within a radius of 4500 mm (15 feet) of fire hydrants.
- G. Before beginning any demolition work, the Contractor shall survey the site and examine the drawings and specifications to determine the extent of the work. The contractor shall take necessary precautions to avoid damages to existing items to remain in place, to be reused, or to remain the property of the Medical Center any damaged items shall be repaired or replaced as approved by the Contracting Officer's Representative. The Contractor shall coordinate the work of this section with all other work and shall construct and maintain shoring, bracing, and supports as required. The Contractor shall ensure that structural elements are not overloaded and shall be responsible for increasing structural supports or adding new supports as may be required as a result of any cutting, removal, or demolition work performed under this contract. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal works. Repairs, reinforcement, or structural replacement must have Contracting Officer's Representative'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.

PART 2 - PRODUCTS (NOT USED)**PART 3 - EXECUTION****3.1 DEMOLITION:**

- A. Completely demolish and remove buildings and structures, including all appurtenances related or connected thereto, as noted below:
 - 1. As required for installation of new utility service lines.
 - 2. To full depth within an area defined by hypothetical lines located 1500 mm (5 feet) outside building lines of new structures.
- B. Debris, including brick, concrete, stone, metals and similar materials shall become property of Contractor and shall be disposed of by him daily, off the Medical Center to avoid accumulation at the demolition site. Materials that cannot be removed daily shall be stored in areas specified by the Contracting Officer's Representative. Break up concrete slabs below grade that do not require removal from present location into pieces not exceeding 600 mm (24 inches) square to permit drainage. Contractor shall dispose debris in compliance with applicable federal, state or local permits, rules and/or regulations.
- C. In removing buildings and structures of more than two stories, demolish work story by story starting at highest level and progressing down to third floor level. Demolition of first and second stories may proceed simultaneously.
- D. Remove and legally dispose of all materials, other than earth to remain as part of project work, from any trash dumps shown. Materials removed shall become property of contractor and shall be disposed of in compliance with applicable federal, state or local permits, rules and/or regulations. All materials in the indicated trash dump areas, including above surrounding grade and extending to a depth of 1500 mm (5 feet) below surrounding grade, shall be included as part of the lump sum compensation for the work of this section. Materials that are located beneath the surface of the surrounding ground more than 1500 mm (5 feet), or materials that are discovered to be hazardous, shall be handled as unforeseen. The removal of hazardous material shall be referred to Hazardous Materials specifications.
- E. Remove existing utilities as indicated or uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Contracting Officer's Representative. When Utility lines are encountered that are not indicated on the drawings, the Contracting Officer's Representative shall be notified prior to further work in that area.

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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.
- 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 03 30 00**CAST-IN-PLACE CONCRETE****1.1 GENERAL****1.2 DESCRIPTION:**

- A. This section specifies cast-in-place structural concrete and materials and mixes for other concrete.

1.3 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Concrete roads, walks, and similar exterior site work: Section 32 05 23, CEMENT AND CONCRETE FOR EXTERIOR IMPROVEMENTS.

1.4 TESTING AGENCY FOR CONCRETE MIX DESIGN:

- A. Testing agency for the trial concrete mix design retained and reimbursed by the Contractor and approved by VA COR. For all other testing, refer to Section 01 45 29 Testing Laboratory Services.
- B. Testing agency maintaining active participation in Program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology. Accompany request for approval of testing agency with a copy of Report of Latest Inspection of Laboratory Facilities by CCRL.
- C. Testing agency shall furnish equipment and qualified technicians to establish proportions of ingredients for concrete mixes.

1.5 TOLERANCES:

- A. Formwork: ACI 117, except the elevation tolerance of formed surfaces before removal of shores is +0 mm (+0 inch) and -20 mm (-3/4 inch).
- B. Reinforcement Fabricating and Placing: ACI 117, except that fabrication tolerance for bar sizes Nos. 10, 13, and 16 (Nos. 3, 4, and 5) (Tolerance Symbol 1 in Fig. 2.1(a), ACI, 117) used as column ties or stirrups is +0 mm (+0 inch) and -13 mm (-1/2 inch) where gross bar length is less than 3600 mm (12 feet), or +0 mm (+0 inch) and -20 mm (-3/4 inch) where gross bar length is 3600 mm (12 feet) or more.
- C. Cross-Sectional Dimension: ACI 117, except tolerance for thickness of slabs 12 inches or less is +20 mm (+3/4 inch) and - 6 mm (-1/4 inch). Tolerance of thickness of beams more than 300 mm (12 inch) but less than 900 mm (3 feet) is +20 mm (+3/4 inch) and -10 mm (-3/8 inch).
- D. Slab Finishes: ACI 117, Section 4.5.6, F-number method in accordance with ASTM E1155, except as follows:

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1. Test entire slab surface, including those areas within 600 mm (2 feet) of construction joints and vertical elements that project through slab surface.
2. Maximum elevation change which may occur within 600 mm (2 feet) of any column or wall element is 6 mm (0.25 inches).
3. Allow sample measurement lines that are perpendicular to construction joints to extend past joint into previous placement no further than 1500 mm (5 feet).

1.6 REGULATORY REQUIREMENTS:

- A. ACI SP-66 - ACI Detailing Manual.
- B. ACI 318 - Building Code Requirements for Reinforced Concrete.
- C. ACI 301 - Standard Specifications for Structural Concrete.

1.7 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, and SAMPLES.
- B. Shop Drawings: Reinforcing steel: Complete shop drawings. Comply with requirements of ACI SP-66. Include bar sizes, material types, lengths, spacings, locations, and quantities of reinforcing steel; bar schedules, stirrup spacing, shapes of bent bars, spacing of bars, and types and location of splices. Include special reinforcement required at openings and flat slab shear reinforcing. Do not reproduce construction documents for shop drawings.
- C. Mill Test Reports:
 1. Reinforcing Steel.
 2. Cement.
- D. Manufacturer's Certificates:
 1. Cement
 2. Aggregate
 3. Lightweight aggregate for structural concrete.
 4. Air-entraining admixture.
 5. Chemical admixtures, including chloride ion content.
 6. Waterproof paper for curing concrete.
 7. Liquid membrane-forming compounds for curing concrete.
 8. Non-shrink grout.
 9. Liquid hardener.
 10. Waterstops.
 11. Expansion joint filler.

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- 12. Adhesive binder.
- 13. Color Pigments
- 14. Vapor Barrier
- E. Product Data:
 - 1. Mechanical Couplers
 - 2. T-Headed Reinforcement
- F. Testing Agency for Concrete Mix Design: Approval request including qualifications of principals and technicians and evidence of active participation in program of Cement and Concrete Reference Laboratory (CCRL) of National Institute of Standards and Technology and copy of report of latest CCRL, Inspection of Laboratory.
- G. Concrete Mix Design: Submit for each type and strength of concrete.
 - 1. Include unit weight, slump, water cement fly ash ratio curves, concrete mix ingredients, admixtures and compression test reports. Results of testing or test data used to establish mix proportions are to be provided for each mix design. Include shrinkage test data for mix designs.
 - 2. Mix designs to be prepared, stamped and signed by a Professional Engineer registered in the State of California.
- H. Construction joints: Submit plans showing proposed construction joint locations. The maximum spacing of joints is to be as indicated in the typical details.

1.8 DELIVERY, STORAGE, AND HANDLING:

- A. Conform to ACI 304. Store aggregate separately for each kind or grade, to prevent segregation of sizes and avoid inclusion of dirt and other materials.
- B. Deliver cement in original sealed containers bearing name of brand and manufacturer, and marked with net weight of contents. Store in suitable watertight building in which floor is raised at least 300 mm (1 foot) above ground. Store bulk cement and fly ash in separate suitable bins.
- C. Deliver other packaged materials for use in concrete in original sealed containers, plainly marked with manufacturer's name and brand, and protect from damage until used.
- D. Store reinforcement in a manner that will prevent rusting or coating with grease, oil, dirt, and other objectionable material.
- E. Deliver reinforcement to the job site bundled, tagged and marked using metal tags.

1.9 PRE-CONCRETE CONFERENCE:

- A. General: At least 15 days prior to submittal of design mixes, conduct a

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meeting to review proposed methods of concrete construction to achieve the required results.

- B. Agenda: Includes but is not limited to:
 - 1. Submittals.
 - 2. Coordination of work.
 - 3. Availability of material.
 - 4. Concrete mix design including admixtures.
 - 5. Methods of placing, finishing, and curing.
 - 6. Finish criteria required to obtain required flatness and levelness.
 - 7. Timing of floor finish measurements.
 - 8. Material inspection and testing.
- C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; admixture manufacturers; VA COR; Consulting Engineer; Department of Veterans Affairs retained testing laboratories for concrete testing and finish (F-number) verification.
- D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

1.10 MOCK-UP:

- A. In addition to the other specified samples and tests, construct a mock-up using the materials, reinforcing, forming system and construction methods proposed for use in exposed architectural concrete.
- B. Construct the mock-up with at least a 2.5 m by 2.5 m (8 feet by 8 feet) exposed surface and suitable foundations. Include the following where applicable: Control joints, reglets, recesses or other typical architectural details.
- C. Before casting the mock-up, submit full detailed Shop Drawings of the mock-up formwork for review by the Architect. Perform all necessary preliminary tests to ensure that concrete used for the mock-up will exactly match the approved sample in color and texture.
- D. Perform the surface treatment proposed for use on one or more areas not less than 300 mm by 300 mm (1 foot by 1 foot) on the back side of the mock-up to establish the texture of finish required by the Architect. Repeat as required until a sample satisfactory to the Architect has been obtained.
- E. Treat the finished front surface of the mock-up to produce a uniform appearance similar in every respect to the approved sample area.
- F. The completed mock-up shall be inspected by the Architect. Failure of the mock-up to match the approved sample will require the construction of further mock-ups until approval is obtained. Remove rejected mock-ups immediately.

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- G. Maintain the approved mock-ups in good condition at the job site until all architectural concrete surfaces have been completed and approved by the Architect. Remove the mock-up from the site after completion of the above.

1.11 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 Concrete Institute (ACI):
1. 117-10 Specifications for Tolerances for Concrete Construction and Materials and Commentary
 2. 211.1-91 (R2009) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
 3. 211.2-98 (R2004) Standard Practice for Selecting Proportions for Structural Lightweight Concrete
 4. 214R-11 Guide to Evaluation of Strength Test Results of Concrete
 5. 301-10 Standard Practice for Structural Concrete
 6. 304R-00 (R2009) Guide for Measuring, Mixing, Transporting, and Placing Concrete
 7. 305R-10 Specification for Hot Weather Concreting
 8. 306R-10 Standard Specification for Cold Weather Concreting
 9. 308.1-11 Specification for Curing Concrete
 10. 309R-05 Guide for Consolidation of Concrete
 11. 318-11 Building Code Requirements for Structural Concrete and Commentary
 12. 347-04 Guide to Formwork for Concrete
 13. SP-66-04 ACI Detailing Manual
- C. American National Standards Institute and American Hardboard Association (ANSI/AHA):
1. A135.4-2004 Basic Hardboard
- D. American Society for Testing and Materials (ASTM):
1. A82/A82M-07 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 2. A185/185M-07 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 3. A615/A615M-09 Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
 4. A653/A653M-11 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process
 5. A706/A706M-09 Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

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6. A767/A767M-09 Standard Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement
7. A775/A775M-07 Standard Specification for Epoxy Coated Reinforcing Steel Bars
8. A820-11 Standard Specification for Steel Fibers for Fiber Reinforced Concrete
9. A996/A996M-09 Standard Specification for Rail Steel and Axle Steel Deformed Bars for Concrete Reinforcement
10. C31/C31M-10 Standard Practice for Making and Curing Concrete Test Specimens in the field
11. C33/C33M-11A Standard Specification for Concrete Aggregates
12. C39/C39M-12 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
13. C94/C94M-12 Standard Specification for Ready Mixed Concrete
14. C143/C143M-10 Standard Test Method for Slump of Hydraulic Cement Concrete
15. C150-11 Standard Specification for Portland Cement
16. C171-07 Standard Specification for Sheet Materials for Curing Concrete
17. C172-10 Standard Practice for Sampling Freshly Mixed Concrete
18. C173-10... Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
19. C192/C192M-07 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory
20. C231-10 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
21. C260-10 Standard Specification for Air Entraining Admixtures for Concrete
22. C309-11 Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete
23. C330-09 Standard Specification for Lightweight Aggregates for Structural Concrete
24. C494/C494M-11 Standard Specification for Chemical Admixtures for Concrete
25. C496-06 Splitting Tensile Strength of Cylindrical Concrete Specimens
26. C567-05 Density of Structural Lightweight Concrete
27. C618-12 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
28. C666/C666M-03 (R2008) Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
29. C881/C881M-10 Standard Specification for Epoxy Resin Base Bonding Systems for Concrete

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30. C1107/1107M-11 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
 31. C1315-11 Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete
 32. D6-95(R2011) Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds
 33. D297-93(R2006) Standard Methods for Rubber Products Chemical Analysis
 34. D412-06AE2 Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
 35. D1751-04(R2008) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)
 36. D4263-83(2012) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
 37. D4397-10 Standard Specification for Polyethylene Sheeting for Construction, Industrial and Agricultural Applications
 38. E1155-96(R2008) Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers
 39. F1869-11 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- E. American Welding Society (AWS):
1. D1.4/D1.4M-11 Structural Welding Code - Reinforcing Steel
- F. Concrete Reinforcing Steel Institute (CRSI):
1. Handbook 2008
- G. National Cooperative Highway Research Program (NCHRP):
1. Report On Concrete Sealers for the Protection of Bridge Structures
- H. U. S. Department of Commerce Product Standard (PS):
1. PS 1 Construction and Industrial Plywood
 2. PS 20 American Softwood Lumber
- I. U. S. Army Corps of Engineers Handbook for Concrete and Cement:
1. CRD C513 Rubber Waterstops
 2. CRD C572 Polyvinyl Chloride Waterstops

PART 2 - PRODUCTS**2.1 FORMS:**

- A. Wood: PS 20 free from loose knots and suitable to facilitate finishing concrete surface specified; tongue and grooved.

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- B. Plywood: PS-1 Exterior Grade B-B (concrete-form) 16 mm (5/8 inch), or 20 mm (3/4 inch) thick for unlined contact form. B-B High Density Concrete Form Overlay optional.
- C. Corrugated Fiberboard Void Boxes: Double faced, completely impregnated with paraffin and laminated with moisture resistant adhesive, size as shown. Design forms to support not less than 48 KPa (1000 psf) and not lose more than 15 percent of their original strength after being completely submerged in water for 24 hours and then air dried.
- D. Form Lining:
 - 1. Hardboard: ANSI/AHA A135.4, Class 2 with one (S1S) smooth side)
 - 2. Plywood: Grade B-B Exterior (concrete-form) not less than 6 mm (1/4 inch) thick.
 - 3. Plastic, fiberglass, or elastomeric capable of reproducing the desired pattern or texture.
- E. Form Ties: Develop a minimum working strength of 13.35 kN (3000 pounds) when fully assembled. Ties shall be adjustable in length to permit tightening of forms and not have any lugs, cones, washers to act as spreader within form, nor leave a hole larger than 20 mm (3/4 inch) diameter, or a depression in exposed concrete surface, or leave metal closer than 40 mm (1 1/2 inches) to concrete surface. Wire ties not permitted. Cutting ties back from concrete face not permitted.

2.2 MATERIALS:

- A. Portland Cement: ASTM C150 Type I or II. Acquire all cement for entire project from the same source.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalies, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33.
 - 1. Size 67 or Size 467 may be used for footings and walls over 300 mm (12 inches) thick.
 - 2. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 7.
 - 3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.
 - 4. Acquire all aggregates for entire project from the same source.
 - 5. Cleanliness not to be less than 75 when tested in accordance with California Test 227
- D. Lightweight Aggregates for Structural Concrete: ASTM C330, Table 1. Maximum size of aggregate not larger than one-fifth of narrowest dimension between forms, nor three-fourth of minimum clear distance between reinforcing bars. Contractor to furnish certified report to verify that

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aggregate is sound and durable, and has a durability factor of not less than 80 based on 300 cycles of freezing and thawing when tested in accordance with ASTM C666.

1. Course aggregate to be rotary kiln-expanded shale or clay having surface scaled by firing
2. Fine aggregate to be a blend of natural sand and lightweight fines.

E. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a 4.75 mm (No. 4) sieve, 10 percent maximum shall pass a 150 μ m (No. 100) sieve.

1. Acquire all aggregates for entire project from the same source.
2. Cleanliness not to be less than 75 when tested in accordance with California Test 217.

F. Mixing Water: Fresh, clean, and potable.

G. Admixtures:

1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
5. Air Entraining Admixture: ASTM C260.
6. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
7. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
8. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.

H. Vapor Barrier: ASTM E1745, Class A, 0.38 mm (15 mil) or greater.

1. Multi-layer plastic extrusion or equivalent, stated by manufacturer as suitable for installation in contact with soil or granular fill under concrete slabs.
2. Permeance of less than 0.01 Perms [grains/(ft² · hr · inHg)] as tested in accordance with ASTM E 1745 Section 7. Provide independent testing data showing compliance.
3. Single ply polyethylene is prohibited.

I. Reinforcing Steel #7 bars and smaller: ASTM A615, or ASTM A996, deformed,

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grade as indicated on the drawings.

- J. Reinforcing Steel, #8 and larger and all bars to be welded: ASTM A706, deformed, grade as indicated on drawings. Permitted for bars #7 and smaller.
- K. Welded Wire Fabric: ASTM A185.
- L. Galvanized Reinforcing Bars: ASTM A767.
- M. Epoxy Coated Reinforcing Bars: ASTM A775.
- N. Cold Drawn Steel Wire: ASTM A82.
- O. Reinforcement for Metal Pan Stair Fill: 50 mm (2 inch) wire mesh, either hexagonal mesh at .8Kg/m² (1.5 pounds per square yard), or square mesh at .6Kg/m² (1.17 pounds per square yard).
- P. Supports, Spacers, and Chairs: Types which will hold reinforcement in position shown in accordance with requirements of ACI 318 except as specified.
- Q. Expansion Joint Filler: ASTM D1751.
- R. Sheet Materials for Curing Concrete: ASTM C171.
- S. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- T. Abrasive Aggregate: Aluminum oxide grains or emery grits.
- U. Liquid Hardener and Dustproofer: Fluosilicate solution of magnesium fluosilicate or zinc fluosilicate. Magnesium and zinc may be used separately or in combination as recommended by manufacturer. Use only on exposed slab. Do not use where floor is covered with resilient flooring, paint or other finish coating.
- V. Moisture Vapor Emissions & Alkalinity Control Sealer: 100% active colorless aqueous silicate solution concrete surface treatment applied the day of the concrete pour for all concrete slabs receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.
 - 1. ASTM C1315 Type 1 Class A, and ASTM C309 Type 1 Class A, penetrating product to have no less than 34% solid content, leaving no sheen, volatile organic compound (VOC) content rating as required to suite regulatory requirements. The product shall have at least a five (5) year documented history in controlling moisture vapor emission from damaging floor covering, compatible with all finish materials.
 - 2. MVE 15-Year Warranty:
 - a. When a floor covering is installed on a below grade, on grade, or above grade concrete slab treated with Moisture Vapor

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Emissions & Alkalinity Control Sealer according to manufacturer's instruction, sealer manufacturer shall warrant the floor covering system against failure due to moisture vapor migration or moisture-born contaminates for a period of fifteen (15) years from the date of original installation. The warranty shall cover all labor and materials needed to replace all floor covering that fails due to moisture vapor emission & moisture born contaminates.

- W. Penetrating Sealer: For use on parking garage ramps and decks. High penetration silane sealer providing minimum 95 percent screening per National Cooperative Highway Research Program (NCHRP) No. 244 standards for chloride ion penetration resistance. Requires moist (non-membrane) curing of slab.
- X. Non-Shrink Grout:
1. ASTM C1107, pre-mixed, produce a compressive strength of at least 18 MPa at three days and 48 MPa (7000 psi) at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 1200 mm x 1200 mm (4 foot by 4 foot) base plate.
 2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 450 mm x 900 mm (18 inch by 36 inch) base plate.
- Y. Adhesive Binder: ASTM C881.
- Z. Waterstops:
1. Polyvinyl Chloride Waterstop: CRD C572.
 2. Rubber Waterstops: CRD C513.
 3. Bentonite Waterstop: Flexible strip of bentonite 25 mm x 20 mm (1 inch by 3/4 inch), weighing 8.7 kg/m (5.85 lbs. per foot) composed of Butyl Rubber Hydrocarbon (ASTM D297), Bentonite (SS-S-210-A) and Volatile Matter (ASTM D6).
 4. Non-Metallic Hydrophilic: Swellable strip type compound of polymer modified chloroprene rubber that swells upon contact with water shall conform to ASTM D412 as follows: Tensile strength 420 psi minimum; ultimate elongation 600 percent minimum. Hardness shall be 50 minimum on the type A durometer and the volumetric expansion ratio in 70 deg water shall be 3 to 1 minimum.
- AA. Porous Backfill: Crushed stone or gravel graded from 25 mm to 20 mm (1 inch to 3/4 inch).
- BB. Fibers:
1. Synthetic Fibers: Monofilament or fibrillated polypropylene fibers for secondary reinforcing of concrete members. Use appropriate length and 0.9 kg/m³ (1.5 lb. per cubic yard). Product shall have a UL rating.
 2. Steel Fibers: ASTM A820, Type I cold drawn, high tensile steel wire

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for use as primary reinforcing in slab-on-grade. Minimum dosage rate 18 kg/m³ (30 lb. per cubic yard).

- CC. Epoxy Joint Filler: Two component, 100 percent solids compound, with a minimum shore D hardness of 50.
- DD. Bonding Admixture: Non-rewettable, polymer modified, bonding compound.
- EE. Reinforcing Steel Mechanical Couplers: Classified as Type 2 Mechanical Couplers per ACI 318. Coupler to be capable of developing 100 percent of the specified tensile strength of the steel and, in tension and compression, at least 125 percent of the specified yield strength (Fy) of the bar. Coupler to have a current ICC-ES report classifying the coupler as Type 2 per ACI. Couplers are to be of the type that are threaded or welded to the ends of the reinforcing bars. Couplers utilizing bolts to attach the coupler to the reinforcing bar are not acceptable.
- FF. Headed and Mechanically Anchored Reinforcement: Headed and mechanically anchored deformed reinforcement is to comply with the provisions of ACI 318, Section 12.6. Products are to be capable of developing the full yield strength of the bar in tension and are to have a current ICC-ES report showing compliance with ACI.
- GG. Shrinkage Reducing Admixture: ASTM C494/C 494M, ASTM C 157

2.3 CONCRETE MIXES:

- A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
 - 1. If trial mixes are used, make a set of at least 6 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test three for compressive strength at 7 days and three at 28 days.
 - 2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate per m³ (cubic yard) measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement -fly ash ratio, and consistency of each cylinder in terms of slump, include dry unit weight of lightweight structural concrete.
 - 3. Prepare a curve showing relationship between water-cement-fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
 - 4. If the field experience method is used, submit complete standard deviation analysis.
- B. Fly Ash Testing: Submit certificate verifying conformance with ASTM 618 initially with mix design and for each truck load of fly ash delivered from source. Submit test results performed within 6 months of submittal date. Notify VA COR immediately when change in source is anticipated.
 - 1. Testing Laboratory used for fly ash certification/testing shall participate in the Cement and Concrete Reference Laboratory (CCRL) program. Submit most recent CCRL inspection report.

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- C. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of VA COR or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. VA COR may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.
- D. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Use Fly Ash as an admixture with 20% replacement by weight in all structural work. Increase this replacement to 40% for mass concrete, and reduce it to 10% for drilled piers and caissons.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength ³		Non-Air-Entrained	Air-Entrained	
Min. 28 Day Comp. Str. MPa (psi)	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio	Min. Cement kg/m ³ (lbs/c. yd)	Max. Water Cement Ratio
35 (5000) ^{1,3}	375 (630)	0.45	385 (650)	0.40
30 (4000) ^{1,3}	325 (550)	0.45	340 (570)	0.45
25 (4000) ^{1,2}	325 (550)	-	340 (570)	-

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 8.3 MPa (1200 psi) in excess of f'c. For concrete strengths above 35 Mpa (5000 psi), the proposed mix design shall achieve a compressive strength 9.7 MPa (1400 psi) in excess of f'c.
 2. Lightweight Structural Concrete. Pump mixes may require higher cement values.
 3. Determined by Laboratory in accordance with ACI 211.1 for normal concrete or ACI 211.2 for lightweight structural concrete.
- E. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

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TABLE II - MAXIMUM SLUMP, mm (INCHES)*

Type of Construction	Normal Weight Concrete	Lightweight Structural Concrete
Reinforced Footings and Substructure Walls	75mm (3 inches)	75 mm (3 inches)
Slabs, Beams, Reinforced Walls, and Building Columns	100 mm (4 inches)	100 mm (4 inches)

- F. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 225 mm (9 inches). The concrete shall arrive at the job site at a slump of 50 mm to 75 mm (2 inches to 3 inches), and 75 mm to 100 mm (3 inches to 4 inches) for lightweight concrete. This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.
- G. Air-Entrainment: Air-entrainment of normal weight concrete shall conform with Table III. Air-entrainment of lightweight structural concrete shall conform with Table IV. Determine air content by either ASTM C173 or ASTM C231.

TABLE III - TOTAL AIR CONTENT**FOR VARIOUS SIZES OF COARSE AGGREGATES (NORMAL CONCRETE)**

Nominal Maximum Size of Total Air Content	Coarse Aggregate, mm (Inches) Percentage by Volume
10 mm (3/8 in).6 to 10	13 mm (1/2 in).5 to 9
20 mm (3/4 in).4 to 8	25 mm (1 in).3-1/2 to 6-1/2
40 mm (1 1/2 in).3 to 6	

TABLE IV**AIR CONTENT OF LIGHTWEIGHT STRUCTURAL CONCRETE**

Nominal Maximum size of Total Air Content	Coarse Aggregate, mm's (Inches) Percentage by Volume
Greater than 10 mm (3/8 in) 4 to 8	10 mm (3/8 in) or less 5 to 9

- H. Drying Shrinkage: Test per ASTM C192 and ASTM C157.
1. Typical: Maximum 0.050 percent unless otherwise indicated.
 2. Slabs-on-grade and Suspended Slabs: Maximum 0.045 percent.
 3. Shrinkage Reducing Admixture: Provide as required to obtain drying shrinkage when adequate shrinkage data for concrete mix design is not

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available.

- I. High early strength concrete, made with Type III cement or Type I cement plus non-corrosive accelerator, shall have a 7-day compressive strength equal to specified minimum 28-day compressive strength for concrete type specified made with standard Portland cement.
- J. Lightweight structural concrete shall not weigh more than air-dry unit weight of 115 pounds per cubic foot. Air-dry unit weight determined on 150 mm by 300 mm (6 inch by 12 inch) test cylinders after seven days standard moist curing followed by 21 days drying at 23 degrees C \pm 1.7 degrees C (73.4 \pm 3 degrees Fahrenheit), and 50 (plus or minus 7) percent relative humidity. Use wet unit weight of fresh concrete as basis of control in field.
- K. Concrete slabs placed at air temperatures below 10 degrees C (50 degrees Fahrenheit) use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).
- L. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. For air content requirements see Table III or Table IV.
- M. Enforcing Strength Requirements: Test as specified in Section 01 45 29, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 3.5 MPa (500 psi) below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, VA COR may require any one or any combination of the following corrective actions, at no additional cost to the Government:
 - 1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
 - 2. Require additional curing and protection.
 - 3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, VA COR may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
 - 4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, VA COR may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
 - 5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional

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construction or replaced, if directed by the VA COR.

2.4 BATCHING AND MIXING:

- A. General: Concrete shall be "Ready-Mixed" and comply with ACI 318 and ASTM C94, except as specified. Batch mixing at the site is permitted. Mixing process and equipment must be approved by VA COR. With each batch of concrete, furnish certified delivery tickets listing information in Paragraph 16.1 and 16.2 of ASTM C94. Maximum delivery temperature of concrete is 38°C (100 degrees Fahrenheit). Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
-1. degrees to 4.4 degrees C (30 degrees to 40 degrees F)	15.6 degrees C (60 degrees F.)
-17 degrees C to -1.1 degrees C (0 degrees to 30 degrees F.)	21 degrees C (70 degrees F.)

1. Services of aggregate manufacturer's representative shall be furnished during the design of trial mixes and as requested by the VA COR for consultation during batching, mixing, and placing operations of lightweight structural concrete. Services will be required until field controls indicate that concrete of required quality is being furnished. Representative shall be thoroughly familiar with the structural lightweight aggregate, adjustment and control of mixes to produce concrete of required quality. Representative shall assist and advise VA COR.

PART 3 - EXECUTION**3.1 FORMWORK:**

- A. General: Design in accordance with ACI 347 is the responsibility of the Contractor. The Contractor shall retain a registered Professional Engineer to design the formwork, shores, and reshores.
1. Form boards and plywood forms may be reused for contact surfaces of exposed concrete only if thoroughly cleaned, patched, and repaired and VA COR approves their reuse.
 2. Provide forms for concrete footings unless VA COR determines forms are not necessary.
 3. Corrugated fiberboard forms: Place forms on a smooth firm bed, set tight, with no buckled cartons to prevent horizontal displacement, and in a dry condition when concrete is placed.
- B. Treating and Wetting: Treat or wet contact forms as follows:
1. Coat plywood and board forms with non-staining form sealer. In hot weather, cool forms by wetting with cool water just before concrete is placed.

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2. Clean and coat removable metal forms with light form oil before reinforcement is placed. In hot weather, cool metal forms by thoroughly wetting with water just before placing concrete.
 3. Use sealer on reused plywood forms as specified for new material.
- C. Size and Spacing of Studs: Size and space studs, wales and other framing members for wall forms so as not to exceed safe working stress of kind of lumber used nor to develop deflection greater than $1/270$ of free span of member.
- D. Unlined Forms: Use plywood forms to obtain a smooth finish for concrete surfaces. Tightly butt edges of sheets to prevent leakage. Back up all vertical joints solidly and nail edges of adjacent sheets to same stud with 6d box nails spaced not over 150 mm (6 inches) apart.
- E. Lined Forms: May be used in lieu of unlined plywood forms. Back up form lining solidly with square edge board lumber securely nailed to studs with all edges in close contact to prevent bulging of lining. No joints in lining and backing may coincide. Nail abutted edges of sheets to same backing board. Nail lining at not over 200 mm (8 inches) on center along edges and with at least one nail to each square foot of surface area; nails to be 3d blue shingle or similar nails with thin flatheads.
- F. Architectural Liner: Attach liner as recommended by the manufacturer with tight joints to prevent leakage.
- G. Wall Form Ties: Locate wall form ties in symmetrically level horizontal rows at each line of wales and in plumb vertical tiers. Space ties to maintain true, plumb surfaces. Provide one row of ties within 150 mm (6 inches) above each construction joint. Space through-ties adjacent to horizontal and vertical construction joints not over 450 mm (18 inches) on center.
1. Tighten row of ties at bottom of form just before placing concrete and, if necessary, during placing of concrete to prevent seepage of concrete and to obtain a clean line. Ties to be entirely removed shall be loosened 24 hours after concrete is placed and shall be pulled from least important face when removed.
 2. Coat surfaces of all metal that is to be removed with paraffin, cup grease or a suitable compound to facilitate removal.
- H. Inserts, Sleeves, and Similar Items: Flashing reglets, steel strips, masonry ties, anchors, wood blocks, nailing strips, grounds, inserts, wire hangers, sleeves, drains, guard angles, forms for floor hinge boxes, inserts or bond blocks for elevator guide rails and supports, and other items specified as furnished under this and other sections of specifications and required to be in their final position at time concrete is placed shall be properly located, accurately positioned, and built into construction, and maintained securely in place.
1. Locate inserts or hanger wires for furred and suspended ceilings only in bottom of concrete joists, or similar concrete member of overhead concrete joist construction.
 2. Install sleeves, inserts and similar items for mechanical services

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in accordance with drawings prepared specially for mechanical services. Contractor is responsible for accuracy and completeness of drawings and shall coordinate requirements for mechanical services and equipment.

3. Do not install sleeves in beams, joists or columns except where shown or permitted by VA COR. Install sleeves in beams, joists, or columns that are not shown, but are permitted by the VA COR, and require no structural changes, at no additional cost to the Government.
4. Minimum clear distance of embedded items such as conduit and pipe is at least three times diameter of conduit or pipe, except at stub-ups and other similar locations.
5. Provide recesses and blockouts in floor slabs for door closers and other hardware as necessary in accordance with manufacturer's instructions.

I. Construction Tolerances:

1. Set and maintain concrete formwork to assure erection of completed work within tolerances specified and to accommodate installation of other rough and finish materials. Accomplish remedial work necessary for correcting excessive tolerances. Erected work that exceeds specified tolerance limits shall be remedied or removed and replaced, at no additional cost to the Government.
2. Permissible surface irregularities for various classes of materials are defined as "finishes" in specification sections covering individual materials. They are to be distinguished from tolerances specified which are applicable to surface irregularities of structural elements.

3.2 PLACING REINFORCEMENT:

- A. General: Details of concrete reinforcement in accordance with ACI 318 and ACI 315, unless otherwise shown.
- B. Placing: Place reinforcement conforming to CRSI DA4, unless otherwise shown.
 1. Place reinforcing bars accurately and tie securely at intersections and splices with 1.6 mm (16 gauge) black annealed wire. Use epoxy-coated tie wire with epoxy-coated reinforcing. Secure reinforcing bars against displacement during the placing of concrete by spacers, chairs, or other similar supports. Portions of supports, spacers, and chairs in contact with formwork shall be made of plastic in areas that will be exposed when building is occupied. Type, number, and spacing of supports conform to ACI 318 and ACI 315. Where concrete slabs are placed on ground, use concrete blocks or other non-corrodible material of proper height, for support of reinforcement. Use of brick or stone supports will not be permitted.
 2. Lap welded wire fabric at least 1 1/2 mesh panels plus end extension of wires not less than 300 mm (12 inches) in structural slabs. Lap welded wire fabric at least 1/2 mesh panels plus end extension of wires not less than 150 mm (6 inches) in slabs on grade.
 3. Splice column steel at no points other than at footings and floor

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levels unless otherwise shown.

- C. Spacing: Minimum clear distances between parallel bars, except in columns and multiple layers of bars in beams shall be equal to nominal diameter of bars. Minimum clear spacing is 25 mm (1 inch) or 1-1/3 times maximum size of coarse aggregate, unless otherwise noted on drawings.
- D. Splicing: Splices of reinforcement made only as required or shown or specified. Accomplish splicing as follows:
 - 1. Lap splices: Do not use lap splices for bars larger than Number 36 (Number 11). Minimum lengths of lap as shown.
 - 2. Welded splices: Splicing by butt-welding of reinforcement permitted providing the weld develops in tension at least 125 percent of the yield strength (fy) for the bars. Welding conform to the requirements of AWS D1.4. Welded reinforcing steel conform to the chemical analysis requirements of AWS D1.4.
 - a. Submit test reports indicating the chemical analysis to establish weldability of reinforcing steel.
 - b. Submit a field quality control procedure to insure proper inspection, materials and welding procedure for welded splices.
 - c. Department of Veterans Affairs retained testing agency shall test a minimum of three splices, for compliance, locations selected by VA COR.
 - 3. Mechanical Splices: Develop 100 percent of the specified tensile strength and, in tension and compression at least 125 percent of the yield strength (fy) of the bars. Stresses of transition splices between two reinforcing bar sizes based on area of smaller bar. Provide mechanical splices at locations indicated. Use approved exothermic, tapered threaded coupling, or swaged and threaded sleeve. Exposed threads and swaging in the field not permitted.
 - a. Initial qualification: In the presence of VA COR, make three test mechanical splices of each bar size proposed to be spliced. Department of Veterans Affairs retained testing laboratory will perform load test.
 - b. During installation: Furnish, at no additional cost to the Government, one companion (sister) splice for every 50 splices for load testing. Department of Veterans Affairs retained testing laboratory will perform the load test.
- E. Bending: Bend bars cold, unless otherwise approved. Do not field bend bars partially embedded in concrete, except when approved by VA COR.
- F. Cleaning: Metal reinforcement, at time concrete is placed, shall be free from loose flaky rust, mud, oil, or similar coatings that will reduce bond.
- G. Future Bonding: Protect exposed reinforcement bars intended for bonding with future work by wrapping with felt and coating felt with a bituminous compound unless otherwise shown.

3.3 VAPOR BARRIER:

- A. Except where membrane waterproofing is required, interior concrete slab

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on grade shall be placed on a continuous vapor barrier.

1. Vapor barrier joints lapped 150 mm (6 inches) and sealed with compatible waterproof pressure-sensitive tape.
2. Patch punctures and tears.
3. Install vapor barrier in accordance with manufacturer requirements.

3.4 SLABS receiving RESILIENT COVERING

- A. Slab shall be allowed to cure for 6 weeks minimum prior to placing resilient covering. After curing, slab shall be tested by the Contractor for moisture in accordance with ASTM D4263 or ASTM F1869. Moisture content shall be less than 3 pounds per 1000 sf prior to placing covering.
- B. In lieu of curing for 6 weeks, Contractor has the option, at his own cost, to utilize the Moisture Vapor Emissions & Alkalinity Control Sealer as follows:
 1. Sealer is applied on the day of the concrete pour or as soon as harsh weather permits, prior to any other chemical treatments for concrete slabs either on grade, below grade or above grade receiving resilient flooring, such as, sheet vinyl, vinyl composition tile, rubber, wood flooring, carpet, epoxy coatings and overlays.
 2. Manufacturer's representative will be on the site the day of concrete pour to install or train its application and document. He shall return on every application thereafter to verify that proper procedures are followed.
 - a. Apply Sealer to concrete slabs as soon as final finishing operations are complete and the concrete has hardened sufficiently to sustain floor traffic without damage.
 - b. Spray-apply Sealer at the rate of 20 m² (200 square feet) per gallon. Lightly broom product evenly over the substrate and product has completely penetrated the surface.
 - c. If within two (2) hours after initial application areas are subjected to heavy rainfall and puddling occurs, reapply Sealer product to these areas as soon as weather condition permits.

3.5 CONSTRUCTION JOINTS:

- A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 24,000 mm (80 feet) in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by VA COR.
- B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.
- C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder

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framing into column.

- D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.
- E. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.

3.6 EXPANSION JOINTS AND CONTRACTION JOINTS:

- A. Clean expansion joint surfaces before installing premolded filler and placing adjacent concrete.
- B. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal.
- C. Provide contraction (control) joints in floor slabs as indicated on the contract drawings. Joints shall be either formed or saw cut, to the indicated depth after the surface has been finished. Complete saw joints within 4 to 12 hours after concrete placement. Protect joints from intrusion of foreign matter.

3.7 PLACING CONCRETE:

- A. Preparation:
 - 1. Remove hardened concrete, wood chips, shavings and other debris from forms.
 - 2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.
 - 3. Have forms and reinforcement inspected and approved by VA COR before depositing concrete.
 - 4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.
- B. Bonding: Before depositing new concrete on or against concrete which has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles. Roughen surfaces to 1/4 inch minimum amplitude by heavy sand-blasting, waterblasting or bush-hammering.
 - 1. Preparing surface for applied topping:
 - a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
 - b. Broom clean and keep base slab wet for at least four hours before topping is applied.
 - c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by

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scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.

- C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete is subject to approval of VA COR.
- D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.
1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
 2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
 3. Do not drop concrete freely more than 3000 mm (10 feet) for concrete containing the high-range water-reducing admixture (superplasticizer) or 1500 mm (5 feet) for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
 4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 500 mm (20 inches) in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
 5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after it's initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
 6. On bottom of members with severe congestion of reinforcement, deposit 25 mm (1 inch) layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.
 7. Concrete on metal deck:
 - a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.
 - 1) The Contractor shall become familiar with deflection characteristics of structural frame to include proper amount of additional concrete due to beam/deck deflection.
- E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 450 mm (18 inch) intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

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1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.8 HOT WEATHER:

- A. Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by VA COR.

3.9 COLD WEATHER:

- A. Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by VA COR.

3.10 PROTECTION AND CURING:

- A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by VA COR.
 1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage 10m²/L (400 square feet per gallon) on steel troweled surfaces and 7.5m²/L (300 square feet per gallon) on floated or broomed surfaces for the curing/sealing compound.
 2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with tape.
 3. Paper: Utilize widest practical width paper and overlap adjacent sheets 50 mm (2 inches). Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.11 REMOVAL OF FORMS:

- A. Remove in a manner to assure complete safety of structure after the following conditions have been met.

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1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.
 2. Take particular care in removing forms of architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.
- B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of minimum 28-day compressive strength specified. For post-tensioned systems supporting forms and shoring not removed until stressing is completed. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.
- C. Reshoring: Reshoring is required if superimposed load plus dead load of the floor exceeds the capacity of the floor at the time of loading. Reshoring accomplished in accordance with ACI 347 at no additional cost to the Government.

3.12 CONCRETE SURFACE PREPARATION:

- A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.
- B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 25 mm (1 inch). Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 150 mm (6 inches) surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.
- C. Upon removal of forms, clean vertical concrete surface that is to receive

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bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.13 CONCRETE FINISHES:**A. Vertical and Overhead Surface Finishes:**

1. Unfinished areas: Vertical and overhead concrete surfaces exposed in pipe basements, elevator and dumbwaiter shafts, pipe spaces, pipe trenches, above suspended ceilings, manholes, and other unfinished areas will not require additional finishing.
2. Interior and exterior exposed areas to be painted: Remove fins, burrs and similar projections on surfaces flush, and smooth by mechanical means approved by VA COR, and by rubbing lightly with a fine abrasive stone or hone. Use ample water during rubbing without working up a lather of mortar or changing texture of concrete.
3. Interior and exterior exposed areas finished: Give a grout finish of uniform color and smooth finish treated as follows:
 - a. After concrete has hardened and laitance, fins and burrs removed, scrub concrete with wire brushes. Clean stained concrete surfaces by use of a hone stone.
 - b. Apply grout composed of one part of Portland cement, one part fine sand, smaller than a 600 μm (No. 30) sieve. Work grout into surface of concrete with cork floats or fiber brushes until all pits, and honeycombs are filled.
 - c. After grout has hardened slightly, but while still plastic, scrape grout off with a sponge rubber float and, about 1 hour later, rub concrete vigorously with burlap to remove any excess grout remaining on surfaces.
 - d. In hot, dry weather use a fog spray to keep grout wet during setting period. Complete finish of area in same day. Make limits of finished areas at natural breaks in wall surface. Leave no grout on concrete surface overnight.
4. Textured: Finish as specified. Maximum quantity of patched area 0.2 m^2 (2 square feet) in each 93 m^2 (1000 square feet) of textured surface.

B. Slab Finishes:

1. Monitoring and Adjustment: Provide continuous cycle of placement, measurement, evaluation and adjustment of procedures to produce slabs within specified tolerances. Monitor elevations of structural steel in key locations before and after concrete placement to establish typical deflection patterns for the structural steel. Determine elevations of cast-in-place slab soffits prior to removal of shores. Provide information to VA COR and floor consultant for evaluation and recommendations for subsequent placements.
2. Set perimeter forms to serve as screed using either optical or laser instruments. For slabs on grade, wet screeds may be used to establish initial grade during strike-off, unless VA COR determines that the method is proving insufficient to meet required finish tolerances and directs use of rigid screed guides. Where wet screeds are allowed,

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they shall be placed using grade stakes set by optical or laser instruments. Use rigid screed guides, as opposed to wet screeds, to control strike-off elevation for all types of elevated (non slab-on-grade) slabs. Divide bays into halves or thirds by hard screeds. Adjust as necessary where monitoring of previous placements indicates unshored structural steel deflections to other than a level profile.

3. Place slabs monolithically. Once slab placement commences, complete finishing operations within same day. Slope finished slab to floor drains where they occur, whether shown or not.
4. Use straightedges specifically made for screeding, such as hollow magnesium straightedges or power strike-offs. Do not use pieces of dimensioned lumber. Strike off and screed slab to a true surface at required elevations. Use optical or laser instruments to check concrete finished surface grade after strike-off. Repeat strike-off as necessary. Complete screeding before any excess moisture or bleeding water is present on surface. Do not sprinkle dry cement on the surface.
5. Immediately following screeding, and before any bleed water appears, use a 3000 mm (10 foot) wide highway straightedge in a cutting and filling operation to achieve surface flatness. Do not use bull floats or darbys, except that darbying may be allowed for narrow slabs and restricted spaces.
6. Wait until water sheen disappears and surface stiffens before proceeding further. Do not perform subsequent operations until concrete will sustain foot pressure with maximum of 6 mm (1/4 inch) indentation.
7. Refer to Section 09 06 00 SCHEDULE OF FINISHES for surface finish requirements.
8. Scratch Finish: Finish base slab to receive a bonded applied cementitious application as indicated above, except that bull floats and darbys may be used. Thoroughly coarse wire broom within two hours after placing to roughen slab surface to insure a permanent bond between base slab and applied materials.
9. Float Finish: Slabs to receive unbonded toppings, steel trowel finish, fill, mortar setting beds, or a built-up roof, and ramps, stair treads, platforms (interior and exterior), and equipment pads shall be floated to a smooth, dense uniform, sandy textured finish. During floating, while surface is still soft, check surface for flatness using a 3000 mm (10 foot) highway straightedge. Correct high spots by cutting down and correct low spots by filling in with material of same composition as floor finish. Remove any surface projections and re-float to a uniform texture.
10. Steel Trowel Finish: Concrete surfaces to receive resilient floor covering or carpet, monolithic floor slabs to be exposed to view in finished work, future floor roof slabs, applied toppings, and other interior surfaces for which no other finish is indicated. Steel trowel immediately following floating. During final troweling, tilt steel trowel at a slight angle and exert heavy pressure to compact cement paste and form a dense, smooth surface. Finished surface shall be smooth, free of trowel marks, and uniform in texture and appearance.

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11. Broom Finish: Finish exterior slabs, ramps, and stair treads with a bristle brush moistened with clear water after surfaces have been floated. Brush in a direction transverse to main traffic. Match texture approved by VA COR from sample panel.
12. Finished slab flatness (FF) and levelness (FL) values comply with the following minimum requirements:
 - a. Areas covered with carpeting, or not specified otherwise in b. below:
 - 1) Slab on Grade:
 - a) Specified overall value FF 25/FL 20
 - b) Minimum local value FF 17/FL 15
 - 2) Level suspended slabs (shored until after testing) and topping slabs:
 - a) Specified overall value FF 25/FL 20
 - b) Minimum local value FF 17/FL 15
 - 3) Unshored suspended slabs:
 - a) Specified overall value FF 25
 - b) Minimum local value FF 17
 - 4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
 - b. Areas that will be exposed, receive thin-set tile or resilient flooring, or roof areas designed as future floors:
 - 1) Slab on grade:
 - a) Specified overall value FF 36/FL 20
 - b) Minimum local value FF 24/FL 15
 - 2) Level suspended slabs (shored until after testing) and topping slabs
 - a) Specified overall value FF 30/FL 20
 - b) Minimum local value FF 24/FL 15
 - 3) Unshored suspended slabs:
 - a) Specified overall value FF 30
 - b) Minimum local value FF 24
 - 4) Level tolerance such that 80 percent of all points fall within a 20 mm (3/4 inch) envelope +10 mm, -10 mm (+3/8 inch, -3/8 inch) from the design elevation.
 - c. "Specified overall value" is based on the composite of all measured values in a placement derived in accordance with ASTM E1155.
 - d. "Minimum local value" (MLV) describes the flatness or levelness below which repair or replacement is required. MLV is based on the results of an individual placement and applies to a minimum local area. Minimum local area boundaries may not cross a construction joint or expansion joint. A minimum local area will be bounded by construction and/or control joints, or by column lines and/or half-column lines, whichever is smaller.
13. Measurements

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- a. Department of Veterans Affairs retained testing laboratory will take measurements as directed by VA COR, to verify compliance with FF, FL, and other finish requirements. Measurements will occur within 72 hours after completion of concrete placement (weekends and holidays excluded). Make measurements before shores or forms are removed to insure the "as-built" levelness is accurately assessed. Profile data for above characteristics may be collected using a laser level or any Type II apparatus (ASTM E1155, "profileograph" or "dipstick"). Contractor's surveyor shall establish reference elevations to be used by Department of Veterans Affairs retained testing laboratory.
 - b. Contractor not experienced in using FF and FL criteria is encouraged to retain the services of a floor consultant to assist with recommendations concerning adjustments to slab thicknesses, finishing techniques, and procedures on measurements of the finish as it progresses in order to achieve the specific flatness and levelness numbers.
14. Acceptance/ Rejection:
- a. If individual slab section measures less than either of specified minimum local FF/FL numbers, that section shall be rejected and remedial measures shall be required. Sectional boundaries may be set at construction and contraction (control) joints, and not smaller than one-half bay.
 - b. If composite value of entire slab installation, combination of all local results, measures less than either of specified overall FF/FL numbers, then whole slab shall be rejected and remedial measures shall be required.
15. Remedial Measures for Rejected Slabs: Correct rejected slab areas by grinding, planing, surface repair with underlayment compound or repair topping, retopping, or removal and replacement of entire rejected slab areas, as directed by VA COR, until a slab finish constructed within specified tolerances is accepted.

3.14 SURFACE TREATMENTS:

- A. Use on exposed concrete floors and concrete floors to receive carpeting except those specified to receive non-slip finish.
- B. Liquid Densifier/Sealer: Apply in accordance with manufacturer's directions just prior to completion of construction.
- C. Non-Slip Finish: Except where safety nosing and tread coverings are shown, apply non-slip abrasive aggregate to treads and platforms of concrete steps and stairs, and to surfaces of exterior concrete ramps and platforms. Broadcast aggregate uniformly over concrete surface at rate of application of 8% per 1/10th m² (7.5 percent per square foot) of area. Trowel concrete surface to smooth dense finish. After curing, rub treated surface with abrasive brick and water to slightly expose abrasive aggregate.

3.15 APPLIED TOPPING:

- A. Separate light-weight concrete topping on floor base slab of thickness and strength shown. Topping mix shall have a maximum slump of 200 mm (8 inches)

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for concrete containing a high-range water-reducing admixture (superplasticizer) and 100 mm (4 inches) for conventional mix. Neatly bevel or slope at door openings and at slabs adjoining spaces not receiving an applied finish.

- B. Placing: Place continuously until entire section is complete, struck off with straightedge, leveled with a highway straightedge or highway bull float, floated and troweled by machine to a hard dense finish. Slope to floor drains as required. Do not start floating until free water has disappeared and no water sheen is visible. Allow drying of surface moisture naturally. Do not hasten by "dusting" with cement or sand.

3.16 RESURFACING FLOORS:

- A. Remove existing flooring areas to receive resurfacing to expose existing structural slab and extend not less than 25 mm (1 inch) below new finished floor level. Prepare exposed structural slab surface by roughening, broom cleaning, and dampening. Apply specified bonding grout. Place topping while the bonding grout is still tacky.

3.17 RETAINING WALLS:

- A. Use air-entrained concrete.
- B. Expansion and contraction joints, waterstops, weep holes, reinforcement and railing sleeves installed and constructed as shown.
- C. Exposed surfaces finished to match adjacent concrete surfaces, new or existing.
- D. Place porous backfill as shown.

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**SECTION 033660
STAINED CONCRETE FLOORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies water-based concrete sealer for interior floors.

1.2 RELATED WORK

- A. Stain Color: Section 09 06 00, 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. Technical data sheets and installation instructions for each product specified.
 2. Manufacturer's certification that installer is qualified installer of specified products.
- C. Qualification Data: For qualified Installer and manufacturer.
- D. Samples: Submit color sample for initial review of selected color, sample 150 by 150 mm (6 by 6 inches).
- E. Shop Drawings: Submit shop drawings showing layout of slab on grade joint layout drawings to be approved by VA COR prior to an concrete slab placements that are to receive concrete stain.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturer of stain and sealer products shall have minimum 10 years experience in the production of chemical stains.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by stain system manufacturer to install manufacturer's product. In addition firm shall have minimum 3 years experience in staining applications and successfully completed not less than 6 projects comparable in scale and complexity.
- C. Source Limitations: Obtain each specified material from same source and maintain high degree of consistency in workmanship throughout Project.
- D. Pre-installation Conference: AT least 7 days prior to construction of Architectural stained concrete mock-up, conduct a meeting with Contractor, installer, and VA COR to review details and proper procedures for application of materials.
- E. Mock-Up:

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1. At location on Project selected by VA COR, prepare 9.2 square meters (100 square foot) mockup for review and approval.
2. Construct mockup using processes and techniques intended for use on permanent work, including curing procedures. Include samples of control and construction joints in mockup panels.
3. Mockup shall be stained and sealed by the individual workers who will actually be performing the work for the Project.
4. Obtain written approval of the mockup from VA COR at least 30 days prior to actual slab installation.
5. Retain approved mockup through completion of the Work for use as a quality standard for finished work.
6. Remove mockup when directed.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver the specified products in original, unopened containers with legible manufacturer's identification and information.
- B. Store specified products in conditions recommended by the manufacturer.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Maintain an ambient temperature of between 10 and 32.2 degrees C (50 and 90 degrees F) during application and at least 48 hours after application..
- B. Protection: Precautions shall be taken to avoid damage or contamination of any surfaces near the work zone. Protect completed stain work from moisture or contamination

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Sealer:
 1. Description: One-component, clear, acrylic-polyurethane sealer resistant to staining, abrasion and ultraviolet (UV) radiation designed to protect concrete hardscapes, floors, cementitious toppings, and vertical concrete.
- B. Floor Polish System:
 1. Description: Water based, urethane-fortified concrete sealer.
- C. Curing Paper: Non-staining glass reinforced kraft paper.

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PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verification of Conditions: Contractor shall examine areas and conditions under which work will be performed and identify conditions detrimental to proper and timely completion of work. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ensure concrete to be stained has been cured a minimum of 14 days, and is free of oils, grease, plaster stains, adhesive, water repellent, and curing membranes.
- B. Protect adjacent surfaces and areas from damage that could be caused by staining and sealing work.
- C. Newly placed concrete shall be sufficiently cured to allow concrete to become surfaces must be uniformly slip-resistant and profiled to meet a Concrete Surface Preparation (CSP) profile of 1-2 per ICRI guidelines.
- D. Some concrete may require abrading to open the surface and make it sufficiently penetrable. In these instances the concrete surface must be sanded using a 60-80 mesh-sanding screen or a grit brush. After sanding, all residues must be removed by power vacuuming. The surface should then be pressure washed or scrubbed using a rotary floor machine.
- E. For preparation, the sandblaster should be capable of producing a light, uniform sandblast and be equipped with a dust collector.
- F. For preparation, the pressure washer should be equipped with a fan tip and have a minimum pressure capability of 14 MPa (4000 psi). Hot water capability may facilitate cleaning of existing concrete.
- G. Acid washing may be required when the above surface preparation does not yield adequate penetration or if there are excessive alkali deposits or surface discoloration. The reacted residue must be abraded using a low-speed floor machine equipped with a 60 mesh screen or a grit brush and then thoroughly rinsed until the rinse water is clear and free of solids, a minimum of two times. After rinsing, neutralize any remaining acid residue by washing with a solution of baking soda (sodium bicarbonate) and water. (Test pH of floor should be 7 or higher.)

3.3 APPLICATION OF SEALER

- A. Concrete substrate shall be completely dry.
- B. Sealer shall be produced by the water-based reactive stain manufacturer.
- C. After the final stain application has dried sufficiently, normally 8-24 hours at 24 degrees C (75 degrees F) and 50 percent relative humidity, remove all contaminates from the surface by dry mopping if required.

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- D. Apply sealer according to manufacturer's written instructions at a rate of 27.6 to 46 square meters (300 to 500 square feet) per gallon per coat. Two coats are required.
- E. Maintain a wet edge at all times.
- F. Allow sealer to completely dry before applying additional coats.
- G. Apply second coat of sealer at 90 degrees to the direction of the first coat using the same application method and rates.
- H. Seal horizontal joints in areas subject to pedestrian or vehicular traffic.

3.4 PROTECTION

- A. Protect floor from traffic for at least 72 hours after final application of sealer.
- B. Use curing paper to cover floor completely with a minimum of seams following sealing, for duration of project. Additional protection (must allow moisture to pass freely) may be applied to protect paper.

3.5 FLOOR POLISHING

- A. Apply floor polish system to interior spaces as scheduled, in accordance with manufacturer's printed recommendations at Project completion.

3.6 MAINTENANCE

- A. Maintain water-based reactive stained and sealed floors by sweeping. Clean spills when they occur and rinse dirt off with water. Wet-clean heavily soiled areas by mopping or by scrubbing with a rotary floor machine equipped with a scrubbing brush and a suitable, high-quality commercial detergent. Maintain interior floors that require polishing by using a compatible, premium-grade, emulsion-type, commercial floor polish, following manufacturer's instructions and safety requirements.

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SECTION 04 72 10**STONE VENEER WALL****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies stone veneer planter using natural stone.

1.2 RELATED WORK

- A. Stone specified: Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Section 32 13 20, SITE CONCRETE
- C. Concrete Reinforcing Steel Institute (CRSI): "Manual of Standard Practice" and "Recommended Practice for Placing Reinforcing Bars".
- D. California Code of Regulations, Title 24, 2007 Edition, also known as California Building Code (CBC).
- E. Sustainable design requirements and procedures including submittal requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.
- F. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.

1.3 QUALITY ASSURANCE

- A. Pre-installation Conference: Conduct conference at Project site with VA COR.
- B. Stone samples for comparison of quality and color are available from the Landscape Architect or Contracting Officer. Contractor shall request access to these samples for review, prior to submitting samples for approval.
- C. Preconstruction Soil Testing: Engage a qualified independent testing agency to test soil reinforcement and backfill materials for compliance with design criteria.
- D. Installer Qualifications: Firm specializing in design and installation of stone walls and :
1. With not less than 2 years documented experience.
 2. With a minimum of five previously constructed successful projects, similar in size and magnitude, using specified wall system; Provide contact names and numbers.
 3. Site supervisor with verifiable qualified experience suitable for this project.

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1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. Stone, samples 4 by 12 by 12 inches, each color and finish.
 - 2. Stone cap, end condition and full size, 1 color and finish. Finish on all 4 exposed faces as shown on Drawings.
- C. Shop Drawings:
 - 1. Stone showing exposed faces, profiles, cross sections, anchorage, reinforcing, jointing and sizes.
- D. List of jobs furnished by the manufacturer, which were similar in scope and at least three (3) years of age.
- E. Mockups: Build 8' long sample planter wall mockup including veneer over prepared, tested and approved concrete wall core to verify selections made under sample submittals and to demonstrate functional and aesthetic effects and set quality standards for materials and execution. Mockup should include color range, texture, bond pattern, and joints. Mockup shall include the corner end condition and cap throughout. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion. Do not continue masonry work until mock-up has been approved by VA COR. Approved mock up shall be the standard of workmanship for the Project.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Store cement, sand, Lime and stone under waterproof covers on planking clear of ground.
- B. Protect Stone from handling, dirt, stain, and water damage.

1.6 WARRANTY

- A. Warranty exterior masonry walls against moisture leaks, any defects and subject to terms of "Warranty of Construction", FAR clause 52.246-21. Provide manufacturer's five year specialty warranty.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by the basic designation only. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
- B. Cast Stone Institute Technical Manual and Cast Stone Institute standard specifications.
- C. American Society for Testing and Materials (ASTM):

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1. A167-99 (2004) Stainless and Heat Resisting Chromium- Nickel Steel Plate, Sheet, and Strip
2. A185-07 Steel, Welded Wire Fabric, Plain for Concrete
3. A615/A615M-08 Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. C33-07 Concrete Aggregates
5. C150-07 Portland Cement
6. C503-08 Marble Dimension Stone (Exterior)
7. C568-08 Limestone Dimension Stone
8. C615-03 Granite Dimension Stone
9. C616-08 Quartz-Based Dimension Stone
10. C979-05 Pigments for Integrally Colored Concrete

PART 2 - PRODUCTS

2.1 PORTLAND CEMENT: ASTM C150, TYPE I.

2.2 SAND: ASTM C144; NATURAL SAND CONTAINING NOT MORE THAN 2% OF SILT AND CLAY BY WEIGHT WITH SPECIFIC GRAVITY NOT LESS THAN 2.65.

2.3 LIME: ASTM C5, SLAKE; SCREEN THROUGH 16 MESH, THEN STORE AND PROTECT FOR 10 DAYS.

2.4 PLANTER WALL SOLID STONE UNITS

A. Natural stone quarried and sawn (except for face) into rectangular shapes and sizes for the planter wall as shown on Drawings.

1. Stone Type: Limestone
2. Color:
 - a. "Chocolate" or approved equal in medium brown tones. Wall should consist of 2/3 this color.
 - b. "Caramel" or approved equal in light brown or khaki tones. Wall should consist of 1/3 this color.
3. Stone native location: Lueders, Texas
4. Texture: Split face on all exposed sides. Contractor shall cut, fabricate, and hand-work the stone in any combination of the 3, as necessary to produce the veneer and cap pieces as specified and as shown on the Drawings. Exceptions to the split face finish on all exposed sides are not acceptable.
5. Saw cut on all non-exposed sides.
6. Face Shape: rectangular with 90 degree corners and parallel sides
7. Individual Stone Height: Varies shown on Drawings.
8. Individual Stone Length (face Width): Varies as shown on Drawings.

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9. Width (Depth from Face) As Shown on Drawings.
 10. Warp bow or twist of stone shall not exceed length/360 or 1/8 inch, whichever is greater.
 11. Moisture Absorption: 6 percent, maximum
 12. Compressive Strength, Dry: 9,000 psi minimum.
 13. Dimensional Tolerances: Plus/minus 1/8 inch from specified dimensions.
 14. Appearance: Natural quarried face without machine marks or scrapes.
 15. Sawn as indicated within these specs shall be means and methods by the Contractor. The Contractor shall proceed in a manner that produces the stone units required as specified herein and as shown on the Drawings. Any Stone that does not meet dimensional or finish Specification will be rejected at the Contractor's expense.
- B. Concrete Wall Core and Foundation: Reinforced concrete with compressive strength of 3,000 psi minimum.
- C. Drainage backfill: Class 2 permeable backfill per Caltrans with Subsurface Drain system as described herein.
- 2.5 GROUT:** CONSIST OF 1 PART PORTLAND CEMENT AND 3 PARTS SAND. ADD UP TO 10% LIME. WHEN THE GROUT CORE IS 2" OR MORE WIDE, ADD 2 PARTS OF PEA GRAVEL TO THE ABOVE GROUT MIX. ADD WATER TO GROUT TO CAUSE IT TO FLOW WITHOUT SEGREGATION INTO ALL VOIDS INTENDED TO BE FILLED, AND TO PRODUCE A 28-DAY STRENGTH OF 2000 PSI. PLASTER SAND MAY BE ADDED TO PREVENT SEGREGATION, PROVIDED STRENGTH IS MAINTAINED. COLOR: MEDIUM TO LIGHT GRAY COLOR ADDED TO MORTAR. SUBMIT COLOR SAMPLES FOR ACCEPTANCE BY VA COR.
- 2.6 REINFORCING MATERIALS**
- A. New, free of rust, Billet steel bars: Current ASTM designation A615.
- B. Bar Reinforcement: ASTM A615.
1. #3 and smaller: Grade 40.
 2. #4 and larger: Grade 60.
 3. Tie wire: #6 minimum, black and annealed.
- C. Bar Reinforcement recycled content shall be a minimum of 75% recycled post consumer steel.
- D. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, galvanized steel, brass, or stainless steel Type 302 or 304.
- E. Stone anchors shall be as required to meet joint spacing indicated on Drawings.

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2.7 ANCILLARY MATERIALS

- A. Dampproofing: Per CALTRANS Standard Specifications, Section 54.
- B. Subsurface Drain behind Retaining-Type Walls: All walls that retain 30 inches of soil or more shall include a subsurface drainage system to relieve water pressure in accordance with Section 68 of the CALTRANS Standard Specifications and as shown. If no subsurface drain is shown, provide corrugated polyethylene plastic tubing per 68-1.02K surrounded with an envelope of Class 2 permeable material per 68-1.025 and wrapped with filter fabric per 68-1.028. Connect drains to storm drain system as accepted by VA COR.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Provide testing and subgrade preparation complete.
- B. Provide subgrade preparation and the base material installation complete, including clearing, grading, excavation, filling and dewatering. Take every precaution to obtain a subgrade of uniform bearing power compacted to a minimum of 95% relative compaction as determined by the ASTM D1557 laboratory test procedure and in Sections 19 and 20 of the Caltrans Standard Specifications.
- C. Do any necessary finish grading and compaction in addition to that performed in accordance with earthwork to bring subgrades after final compaction to required grades and sections as indicated. Place no material on muddy subgrade. Remove un-compactable material and replace with clean fill and compact as required.
- D. Excavate to lines and grades shown on Drawings. Do not disturb embankment or foundation beyond lines. Minimize over-excavation.
- E. After excavation and prior to placement of leveling materials, Contractor's Geotechnical engineer shall examine bearing soil surface to verify strength meets or exceeds design requirement and assumptions and issue report to VA COR for acceptance. Replace any unsuitable bearing soil as directed by Geotechnical Engineer.

3.2 REINFORCEMENT

- A. Concrete wall and footing shall be steel reinforced

3.3 INSTALLATION

- A. Install in accordance with Drawings and applicable codes and regulations.
 - 1. Erection Tolerances:
 - a. Variation for face plane of a solid stone unit (split faced surface) may be 1/4" maximum.

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- b. Offset from true alignment between two connecting members (adjacent stone units) may be 3/8" maximum.
 - c. Joint spacing as indicated on Drawings. Deviation from specified joint spacing shall be 1/8 inch maximum for horizontal joints, 1/4 inch maximum for vertical joints.
 - 2. Mortar joints as shown on Drawings. Recess mortar joints as shown on Drawings. Provide pitch on joints in top surface of wall to drain. Strike all joints to provide dense mortar.
 - 3. Place first course of units on concrete foundation; check alignment and level. Check for full contact with base and for stability.
 - 4. Place units side by side aligning face of wall using string line or offset from base line.
 - 5. Insert anchoring devices as required. Check for proper alignment and batter. Place succeeding courses.
- B. Setting Stones:
- 1. Distribute stones as shown on drawings. Brush free of dust or other foreign matter and thoroughly wet before placing. Set in full mortar beds.
 - 2. Provide sufficient number of stones to install complete wall from lines and grades shown on the drawings and details.

3.4 DAMPPROOFING

- A. Mop apply one heavy coat of asphalt to a minus 2 inches below finished soil grade on soil side of retaining wall.

3.5 CLEANUP:

- A. Exercise care that no mortar or grout comes in contact with exposed face of work. Clean immediately.
- B. Use only stiff fiber brushed and wooden scrapers in keeping work clean as it progresses or in cleaning down at completion. Use no metal implements.

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 05 12 00**STRUCTURAL STEEL FRAMING****PART 1 - GENERAL****1.1 DESCRIPTION:**

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

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Painting: Section 09 91 00, PAINTING.
- C. Steel Decking: Section 05 31 00, STEEL DECKING.
- D. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- E. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.

1.3 QUALITY ASSURANCE:

- A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Complex Steel Building Structures fabrication plant. Quality Assurance Plan shall also be in conformance with Appendix Q of AISC 341 for the Seismic Load Resisting System. Work to be performed by a fabricator certified under the AISC Quality Certification Program and an erector certified under the AISC Erector Certification Program as described below.
 - 1. Steel Fabricators - shall be a qualified fabricator who participates in the AISC certification program and is designated an AISC Certified Plant, Category STD. Fabricators that do not participate in the AISC certification program must present documentation to demonstrate equivalent quality management process and procedures that will be reviewed by the VA COR as part of the pre-fabrication/pre-erection conference noted in Section 05 12 00 - Article 3.8, item A. All of the following elements must be in place to be considered as demonstrating equivalence:
 - a. All welders are qualified per American Welding Society (AWS) D1.1. Documentation of welder qualification is available for review by inspection personnel.
 - b. Written welding procedures, compliant with AWS D1.1 specifications, are provided to, and used by all welders.
 - c. Written bolt tightening procedures, compliant with Research Council on Structural Connections (RCSC) specifications, are in provided for, and used in all bolting work.

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- d. Written procedures for contract and project specification review are provided to all individuals in the organization responsible to assure contract compliance. These procedures shall include a system for requests for information necessary to resolve discrepancies or variations from contract requirements.
 - e. Written procedures for inspection and the qualification of inspection personnel to verify that product quality meets project requirements. Inspection procedures shall meet AWS D1.1 requirements for "Contractor's Inspector" and RCSC requirements.
 - f. Written material procurement procedures are in place to ensure that material is ordered in accordance with design drawings and specifications.
 - g. Written inspection procedures are in place to ensure material received meets the purchase order and ASTM requirements.
 - h. Written procedures for correction of non-conforming work are provided to, and used by all shop personnel performing such work.
2. Steel Erectors - shall be a qualified erector who participates in the AISC certification program and is designated an AISC Certified Steel Erector (CSE). Erectors that do not participate in the AISC certification program must present documentation to demonstrate equivalent quality management process and procedures that will be reviewed by the VA COR as part of the pre-fabrication/pre-erection conference noted in Section 05 12 00 - Article 3.8, item A. All of the following elements must be in place to be considered as demonstrating equivalence:
- a. All welders are qualified per American Welding Society (AWS) D1.1. Documentation of welder qualification is available for review by inspection personnel.
 - b. Written welding procedures, compliant with AWS D1.1 specifications, are provided to, and used by all welders.
 - c. Written bolt tightening procedures, compliant with Research Council on Structural Connections (RCSC) specifications, are in provided for, and used in all bolting work.
 - d. Written procedure for fall protection is provided for and periodically updated and recorded by a person trained in fall protection and authorized to require needed corrections to the procedure.
 - e. All crane operators are CCO certified and equivalently trained and/or experienced.
 - f. Project specific erection plans with written hoisting and erection requirements are provided for and used in the field.
 - g. Written documentation of safety orientation for newly hired workers.
 - h. Written procedures for contract and project specification review are provided to all individuals in the organization responsible to assure contract compliance. These procedures shall include a system for requests for information necessary to resolve discrepancies or variations from contract requirements.
 - i. Written procedures for inspection and the qualification of inspection personnel to verify that product quality meets project

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requirements. Inspection procedures shall meet AWS D1.1 requirements for "Contractor's Inspector" and RCSC requirements.

- j. Written procedures for correction of non-conforming work are provided to, and used by all field personnel performing such work.

- B. Before authorizing the commencement of steel erection, the Controlling Contractor shall ensure that the steel erector is provided with the written notification required by 29 CFR 1926.752. Provide copy of this notification to the VA COR.
- C. Additional quality assurance requirements for members and connections of the Seismic Load Resisting System (SLRS) shall be made in accordance with the requirements of AISC 341 and AWS D1.8.

1.4 TOLERANCES:

- A. Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - (AISC Steel Construction Manual, Thirteenth Edition, Page 1-9), except as follows:
 - 1. Elevation tolerance for column splice points at time member is erected is 10 mm (3/8 inch).
 - 2. Elevation tolerance for top surface of steel beams and girders at connections to columns at time floor is erected is 13 mm (1/2 inch).
 - 3. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch)

1.5 REGULATORY REQUIREMENTS:

- A. AISC 360: Specification for Structural Steel Buildings.
- B. AISC 303: Code of Standard Practice for Steel Buildings and Bridges, modified as follows.
 - 1. Section 3. - Design Drawings and Specifications, Paragraph 3.3 Discrepancies, Delete the paragraph: "When discrepancies exist between the Design Drawings and Specifications, the Design Drawings shall govern..."
 - 2. Section 4 - Approval, Paragraph 4.4.1; Delete subparagraph (b) "Confirmation that the Owner's Designated Representative for Design has reviewed and approved the Connection details shown on the Shop and Erection Drawings"
- C. AISC: Seismic Provisions for Structural Steel Buildings.

1.6 SUBMITTALS:

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop and Erection Drawings: Include complete details, schedules, procedures and diagrams for fabrication and assembly of structural steel

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members. Provide all dimensional and geometric information, grade of steel, shop surface treatments and shop connections. Shop drawings shall not be reproductions of the Contract Drawings. Include details of cuts, connections, camber, holes, and other pertinent data. Braced frame gusset plates are to be clearly detailed showing all dimensional information, layouts, connection geometries and work points. Indicate welds by standard AWS symbols, and show size, length, and type of each weld. Clearly distinguish between shop and field welds. Clearly indicate welds that are designated as Demand Critical (DC) and part of the SLRS (CVN). Provide setting drawings, templates, and directions for installation of anchor bolts and other anchorage. Indicate profiles, sizes, spacing, lengths and locations of structural members, indicating stiffener and continuity plates, bolts, fasteners, welds and attachments. Indicate where backing bars are to be removed and locations where weld tabs are to be removed.

C. Certificates (all to be provided in English):

1. Structural steel.
2. Steel for all connections.
3. Welding materials.
4. Shop coat primer paint.
5. High strength bolts

D. Test Reports:

1. Welders' qualifying tests.

E. Record Surveys

F. Review of submittals and shop drawings covers only the general scheme and character of the details. Such review does not relieve the Contractor from responsibility for executing the work in accordance with the contract documents.

G. Wedge(Expansion) and Adhesive Anchor Product Data:

1. Manufacturer's data to include description, type, reference numbers, sizes, installation methods and design values recognized by testing agency.
2. ICC-ES or IAPMO-ES reports showing compliance with specified criteria.

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 Institute of Steel Construction (AISC):

1. AISC 360-10 Specification for Structural Steel Buildings
2. AISC 303-10 Code of Standard Practice for Steel Buildings and Bridges
3. AISC 341-10 Seismic Provisions for Structural Steel Buildings.

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4. AISC 358-10 Prequalified Connections for Special and Intermediate Steel Moment Frames for Seismic Applications, including Supplement No.1 and Supplement No. 2.
 5. Steel Construction Manual, Fourteenth Edition, 2011
- C. American National Standards Institute (ANSI):
1. B18.22.1-65(R2008) Plain Washers
 2. B18.22M-81(R2000) Metric Plain Washers
 3. 23.1-98 Beveled Washers
- D. American Society for Testing and Materials (ASTM):
1. A6/A6M-11 Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
 2. A36/A36M-08 Standard Specification for Carbon Structural Steel
 3. A53/A53M-10 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 4. A108/A108M-07 Standard Specification for Steel Bar, Carbon and Alloyed, Cold-Finish
 5. A123/A123M-09 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 6. A242/A242M-04(R2009) Standard Specification for High-Strength Low-Alloy Structural Steel
 7. A283/A283M-03(R2007) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
 8. A307-10 Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 9. A325-10 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 10. A435/435M-01 Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates
 11. A490-12 Standard Specification for Heat-Treated Steel Structural Bolts 150 ksi Minimum Tensile Strength
 12. A500/A500M-10a Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 13. A501-07 Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
 14. A572/A572M-07 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
 15. A780-06 Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 16. A898/898M-01 Standard Specification for Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes
 17. A992/A992M-02 Standard Specification for Structural Steel Shapes

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18. C1107-05 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
 19. F436-04 Standard Specification for Hardened Steel Washers
 20. F844-04e1 Standard Specification for Washers, Steel, Plan (Flat), Unhardened for General Use
 21. F1554-04 Standard Specification for Anchor Bolts, Steel, 36,55 and 105 ksi Yield Strength
 22. F1852-08 Standard Specification for "Twist Off" Type Tension Control Structural Bolt/Nut/Washer Assemblies, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
- E. American Welding Society (AWS):
1. D1.1/D1.1M-10 Structural Welding Code-Steel
 2. D1.8/D1.8M-09 Structural Welding Code - Seismic Supplement
 3. C4.1-G Oxygen Cutting Surface Roughness Gauge
 4. C4.1-WC Criteria for Describing Oxygen-Cut Surfaces
- F. Research Council on Structural Connections (RCSC) of The Engineering Foundation:
1. Specification for Structural Joints Using ASTM A325 or A490 Bolts
- G. Military Specifications (Mil. Spec.):
1. MIL-P-21035 Paint, High Zinc Dust Content, Galvanizing, Repair
- H. Occupational Safety and Health Administration (OSHA):
1. 29 CFR Part 1926-2001 Safety Standards for Steel Erection

1.8 DEFINITIONS

- A. Heavy Structural Sections -ASTM A6 hot rolled shapes with flanges thicker than 1.5 inches, and plates exceeding 2 inches in thickness.
- B. Seismic Load Resisting System (SLRS) - assembly of structural elements that resist seismic forces including columns, beams, braces, collectors, shear walls, and the interconnections between the elements. The SLRS does not include elements that provide out-of-plane bracing to components of the SLRS nor components designed to resist gravity loads only.
- C. Demand Critical Welds (DC)- structural welds identified on the drawings applicable to the designated SLRS. All welds that are part of the SLRS are demand critical welds unless specifically indicated otherwise.
- D. Protected Zones - portions of the EBF and bracing connections where miscellaneous connections such as tack welds, erection aids, shear studs, decking attachments, bolts, screws or other such attachments are prohibited.
- E. Architecturally Exposed Structural Steel (AESS) - applies to members specifically designated by the Contract Documents.

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F. Building SLRS Descriptions:

1. The SLRS consists of concrete on metal deck roof diaphragms laterally supported by the existing eccentrically braced steel frames in the existing Building 100. At the roof level the lateral load is transferred through the roof diaphragm to the Level 2 diaphragm of Building 100. The building is seismically connected to Building 100.

PART 2 - PRODUCTS**2.1 MATERIALS:**

- A. Structural Steel Angles and Channels: ASTM A36.
- B. Steel W Shapes and Tees: ASTM A992.
- C. Structural Tubing: ASTM A500, Grade B.
- D. Structural Tubing: ASTM A501.
- E. Steel Pipe: ASTM A53, Grade B.
- F. Steel Plates: ASTM A36 or ASTM A572, Grade 50, as indicated on the drawings.
- G. Bolts, Nuts and Washers:
 1. High-strength bolts, including nuts and washers: ASTM A325. High strength bolts are typical, unless otherwise noted on the drawings.
 2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
 3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.
 4. High-strength bolts, twist-off assemblies: ASTM F1852.
- H. Zinc Coating: ASTM A123.
- I. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.
- J. Anchor Rods: ASTM A1554, Grade as indicated on the drawings, with matching ASTM A563 nuts and ASTM F436 Type 1 washers.
- K. Shear Connectors (Automatic End Welded Studs): Headed stud type, ASTM A 108, Grade 1015 through 1020, cold finished low-carbon steel, minimum tensile strength of 60,000 psi; sizes and numbers as indicated, and dimensions complying with AISC Specifications
- L. Welding materials: AWS D1.1; type required for materials being welded. Electrodes to be low hydrogen E7XTX, E7XTXX or E70XXX as applicable.
 1. Welds that are part of the SLRS and welds designated as Demand Critical (DC) on the drawings are to meet CVN toughness requirements in accordance with Sections 4a and 4b of AISC 341.

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- M. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C1107 and capable of developing a minimum compressive strength of 7,000 psi (48 MPa) at 28 days.
- N. Wedge 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 2006 IBC. Install anchors in accordance with the ICC-ES report and manufacturers instructions. Provide stainless steel anchors for exterior use or when exposed to weather. Provide galvanized carbon steel anchors at other locations, unless otherwise noted.
- O. Adhesive Anchors: Tested and qualified for use in cracked concrete per ACI 355.2 and ICC-ES AC 308. Anchors to have a current ICC-ES report approved for cracked concrete (seismic) use under the 2006 IBC. Install anchors in accordance with the ICC-ES report and manufacturers instructions. Provide hot-dip galvanized anchors for exterior use or when exposed to weather.

PART 3 - EXECUTION**3.1 CONNECTIONS (Shop and Field):**

- A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required. In addition to the requirements of AWS D1.1, welders are to pass the Supplemental Welder Qualification for Restricted Access Welding per Section 5 of AWS D1.8 as required.
- B. High-Strength Bolts: High-strength bolts tightened to a bolt tension not less than proof load given in Specification for Structural Joints Using ASTM A325 or A490 Bolts. Tightening done with properly calibrated wrenches, by turn-of-nut method or by use of direct tension indicators (bolts or washers). Tighten bolts in connections identified as slip-critical using Direct Tension Indicators or the turn-of-the-nut method.
- C. For the Seismic Load Resisting System (SLRS), additional welding and bolting requirements are to be followed as required in AWS D1.8 Seismic Supplement and AISC 341 - Seismic Provisions, and these provisions.

3.2 FABRICATION:

- A. Fabrication and quality Control in accordance with Chapter M of AISC 360.
- B. At beams supporting metal deck with concrete fill, space shear connectors at 12 inches on center, unless otherwise noted.
- C. Fabricate structural steel in one location, by one fabricator.
- D. Provide camber for beams and girders as noted on drawings. Where no camber is noted, provide natural camber up, except at cantilevers. Coordinate all Fabrication and QC activities with Quality Assurance activities to be

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performed by the Testing Laboratory identified in Section 01 45 29 of this Specification. Provide Testing Laboratory personnel with schedule, access, and documentation needed to ensure that testing activities can be performed without undue delay to the work.

- E. Field cutting or other alteration of structural steel is not allowed without prior approval of the VA COR.
- F. Repair galvanized steel in accordance with ASTM A 780
- G. Grout solidly between steel base and end plates and concrete bearing surfaces, complying with manufacturer's instructions for non-shrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.
- H. Welding Procedure Specification (WPS) written for each weld used on the project before the start of work. Include all information required by AWS D1.1 and the Sample Welding Form given in the Annex to AWS D1.1, including the power source and for demand critical welds, electrode manufacturer and trade name. Record the name of the individuals responsible for the suitability of the WPS on the WPS. Written procedure for back gouging, grinding, re-welding and the application of the reinforcing fillets as required for the completed weld.
- I. Procedure Qualification Records (PQR) for WPS's that are not pre-qualified per AWS D1.1 prior to the start of work. Submit a PQR for each weld made up of a combination of different welds and/or filler metals, even if those welds are individually qualified or prequalified.
- J. Distortion Control Program -specify welding sequence requirements for connections between beams and columns. Include the sequence of flange and web welding and bolting to maintain alignment of structural steel members where applicable.
- K. Contractor is solely responsible for the quality of the work.
- L. Shear connector welding: AWS D1.1.
 - 1. Do not shop weld studs to top flanges of floor beams. Field install studs after metal decking surface has been installed.
 - 2. Weld studs with automatically timed stud welding equipment connected to suitable source of direct current electrode negative power. Calibrate voltage, current, time, and gun settings for optimal welding based on manufacturer's recommendations
- M. Shop fabricate structural steel to the greatest extent possible. Where permissible, hot-dip galvanize members in completed assemblies.

3.3 SHOP PAINTING:

- A. General: Shop paint steel with primer in accordance with AISC 303, Section 6, Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.

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- C. Do not apply paint to following:
 - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
 - 2. Surfaces which will be encased in concrete.
 - 3. Surfaces which will receive sprayed on fireproofing.
 - 4. Top flange of members which will have shear connector studs applied.
- D. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.
- E. Galvanize all exterior structural steel members, connections and fasteners and other members called for on the Drawings.
- F. AESS members: Refer to Division 9 to ensure primer is compatible with specified finish paint.
- G. Members to receive intumescent coatings as required in Division 9 shall not have shop applied primer unless specifically required by the manufacturer.

3.4 ERECTION:

- A. General: Erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges and Chapter M of AISC 360.
- B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with AISC 303, Section 7, Code of Standard Practice for Steel Buildings and Bridges.
- C. The use of Post Weld Heat Treatment (PWHT) is permitted at the Contractor's option, but is not required. The use of PWHT shall meet the Stress-Relief Heat Treatment limitations of AWS D1.1, Section 5.8, and shall be used as needed to produce quality welds. The use of peening is permitted at the Contractor's option, but not required. Provide a written procedure for performing peening incorporated into the WPS for the joints to be peened.
- D. Non-fusible backing: Nonfusible backing materials, including ceramic and copper: permitted only with satisfactory welder qualification testing performed using the type of backing proposed for use, using the test plate shown in AWS D1.1-98, Figure 4.21, except that groove dimensions shall be as provided in the WPS and PQR. Should the joint include welding a beam flange to a column flange through an access hole, perform Supplementary Welder Qualification Test of Appendix B using the type of proposed backing material. Nonfusible weld tabs and short segments of nonfusible backing bars used at the ends of welds between shear tabs and column faces, or at the ends of continuity plate welds, special welding personnel and welding procedure qualification testing is not required. The welder shall be trained in the proper welding techniques for using such nonfusible weld tabs and backing bars prior to performing such welding on the project.

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3.5 FIELD PAINTING:

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.
- B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Repair galvanized steel in accordance with ASTM A780.

3.6 ADDITIONAL REQUIREMENTS FOR FABRICATION AND ERECTION OF MEMBERS AND CONNECTIONS OF THE SEISMIC LOAD RESISTING SYSTEM (SLRS)

- A. Members and connections of the SLRS (as noted on the drawings) shall meet additional fabrication and erection requirements for both welding and bolting as specified in the following Sections of AISC 341 and AISC 358 (where noted):
 - 1. 5.2. - Shop Drawings
 - 2. 5.3. - Erection Drawings
 - 3. 6.1. - Material Specifications
 - 4. 6.3. - Heavy Section CVN Requirements
 - 5. 7.2. - Bolted Joints
 - 6. 7.3. - Welded Joints (including all subsections)
 - 7. 7.4. - Protected Zone
 - 8. 7.5. - Continuity Plates and Stiffeners
 - 9. W2.2 - Shop Drawings
 - 10. W2.3 - Erection Drawings
 - 11. W5 - Additional Welding Provisions (including all subsections)
 - 12. W6 - Additional Welding Provisions for Demand Critical Welds Only (including all subsections)

3.7 ADDITIONAL REQUIREMENTS FOR QUALITY CONTROL (QC) OF MEMBERS AND CONNECTIONS OF THE SEISMIC LOAD RESISTING SYSTEM (SLRS)

- A. Members and connections of the SLRS are to meet additional quality control tasks and documentation for both welding and bolting as specified in Chapter J, Quality Control and Quality Assurance, of AISC 341:
- B. Ultrasonically examine, prior to welding, all Heavy Structural Section columns for evidence of laminations, inclusions or other discontinuities in accordance with ASTM A435 or ASTM A 898, Level 1 criteria, in zones 3 inches above and below beam flange connection locations.
- C. Holes and Attachments: No holes may be drilled or punched in either flange of the beam within the length of the Protected Zone. Spot welds for the attachment of metal decking are permitted. The Contractor to take measures

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to ensure that other trades do not cause discontinuities in the Protected Zones (as defined in Section I2.1 of AISC 341) through the entire duration of the construction of the project.

3.8 PRE-FABRICATION/PRE-ERECTION CONFERENCE:

- A. Pre-Fabrication / Pre-Erection Conference: Prior to fabrication and following WPS approvals, convene a pre-construction meeting, or series of meetings to review fabrication and erection methods, submittals, sequencing, and testing and inspection as required. At least one such meeting shall be held prior to the start of both fabrication and erection. Representatives of Contractor's fabrication and erection personnel, Contractor's QC personnel, Testing Laboratory personnel, VA COR, members of the Design Team and all other interested parties are to attend these meetings.

3.9 SURVEY:

- A. Prior to the submittal of any shop drawings for structural steel base plates or columns, a survey of all existing anchor rod locations and elevations shall be performed by a Land Surveyor or Civil Engineer registered in the State of California and submitted to the VA COR. The Contractor shall retain and pay for these services in accordance with Section 10 00 00 of these specifications. The survey shall identify all anchor rod locations that do not comply with the tolerance limits specified in this Section, and the amount by which the anchor rod is out of tolerance. Resolution of anchor rod locations that do not meet these tolerance limits shall be made in accordance with Section 10 00 00, GENERAL REQUIREMENTS, of these specifications. See also "SURVEY" portion of Section 10 00 00 of these specifications. Erection of columns and base plates will not be permitted until all such discrepancies are resolved and approved by the VA COR. Reports shall be prepared by a Registered Land Surveyor or Registered Civil Engineer as specified in Section, 10 00 00, GENERAL REQUIREMENTS. Report shall specify that location of structural steel and anchor rods is acceptable for plumbness, level and alignment within specified tolerances specified in the AISC Code of Standard Practice.
- B. Upon completion of finish bolting or welding on any part of the work, and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, submit a certified report of survey to VA COR for approval. Reports shall be prepared by Registered Land Surveyor or Registered Civil Engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS. Report shall specify that location of structural steel is acceptable for plumbness, level and alignment within specified tolerances specified in the AISC Code of Standard Practice and the requirements of this Section.

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SECTION 05 31 00**STEEL DECKING****PART 1 - GENERAL****1.1 DESCRIPTION:**

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

1.2 RELATED WORK:

- A. Sustainable design requirements and procedures including submittal requirements: Section 01 81 11.02, SUSTAINABLE DESIGN REQUIREMENTS.
- B. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- C. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- D. Finish Painting: Section 09 91 00, PAINTING.

1.3 DESIGN REQUIREMENTS:

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

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.
- D. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.

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- E. LEED Submittals: Submit in accordance with Section 01 81 11.02.
1. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.
 2. LEED Product Data Submittal Form: Submit completed product data form provided by the Contracting Officer's Representative; certified by vendor, installer, subcontractor, and/or manufacturer as appropriate.
- F. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are UL listed as a "Steel Floor and Form Unit".
- G. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.

1.5 QUALITY ASSURANCE

- A. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum of 5 years experience.
- C. Welders and welding procedures to be qualified in accordance with AWS D1.1 and D.1.3

1.6 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
1. A36/A36M-08 Standard Specification for Carbon Structural Steel
 2. A611-97 Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled
 3. A653/A653M-08 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
 4. C423-08 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (ninth Edition, 1989)
 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)

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- D. American Iron and Steel Institute (AISI):
 - 1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members
- E. American Welding Society (AWS):
 - 1. D1.1-06, Structural Welding Code - Steel
 - 2. D1.3-08, Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
 - 1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement
 - 2. Factory Mutual Research Approval Guide (2002)
- G. Military Specifications (Mil. Spec.)
 - 1. MIL-P-21035B Paint, High Zinc Dust Content, Galvanizing Repair

1.7 DELIVERY, STORAGE AND HANDLING:

- A. Deliver, store and handle decking in a manner to prevent damage or deformation.
- B. Cut plastic wrap to encourage ventilation.
- C. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS**2.1 MATERIALS:**

- A. Steel Decking: ASTM A653, Structural Quality .
- B. Galvanizing: ASTM A653, G90.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- D. Primer for Shop Painted Sheets: Manufacturer's standard primer (2 coats). When finish painting of steel decking is specified in Section 09 91 00, PAINTING primer coating shall be compatible with specified finish painting.
- E. Miscellaneous Steel Shapes, Bearing Plates, Bent Plates and Angles: ASTM A36.
- F. Welding Electrode: Low hydrogen, E70XX minimum.

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- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges, unless otherwise detailed on drawings. Same quality as deck units but not less than 3.2 mm (10 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
 4. Ridge and Valley Plates: Provide 1.3 mm (18 gauge), minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 40 mm per meter (1/2 inch per foot).
 5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the Drawings. Fabricate cant strips from 1 mm (20 gauge) metal with a minimum 125 mm (5 inch) face width.
 6. Seat Angles for Deck: Provide where a beam does not frame into a column.
 7. Sump Pans for Roof Drains: Fabricated from single piece of minimum 1.9 mm (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 75 mm (3 inches) wide. Recess pans not less than 38 mm (1 1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

2.2 REQUIREMENTS:

- A. Provide steel decking of the type, depth, gauge, and section properties as shown on the drawings.
- B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gauge requirements as shown on the Contract Documents.
 1. Wide Rib (Type B) deck.
 2. Finish: Galvanized G-90.
- C. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light fixtures,

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

PART 3 - EXECUTION**3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- F. Fastening Deck Units:
 - 1. Unless otherwise noted on drawings, fasten roof deck units to steel supporting members by not less than 13 mm (1/2 inch) effective diameter puddle welds or elongated welds of equal strength, spaced not more than 305 mm (12 inches) o.c. at every support, and at closer spacing where required for lateral force resistance by diaphragm action. Attach split or partial panels to the structure in every valley. In addition, secure deck to each supporting member in ribs where side laps occur. Power driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified above is provided. Submit test data and design calculations verifying equivalent design strength.
- G. Cutting and Fitting:
 - 1. Cut all metal deck units to proper length in the shop prior to shipping.
 - 2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the Structural Drawings.
 - 3. Other penetrations shown on the approved metal deck shop drawings but not shown on the Structural Drawings are to be located, cut and reinforced by the trade requiring the opening.
 - 4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.

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

3.2 WELDING:

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

3.3 FIELD REPAIR:

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

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 05 36 00**COMPOSITE METAL DECKING****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies material and services required for installation of composite steel decking including shear connector studs and miscellaneous closures required to prepare deck for concrete placement as shown and specified.

1.2 RELATED WORK:

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and information necessary to complete the installation as shown and specified, including supplementary framing, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics as specified herein.
- D. Manufacturer's written recommendations for:
 - 1. Cleaning of steel decking prior to concrete placement.
- E. Test Report - Establishing structural characteristics of composite concrete and steel decking system.
- F. Test Report - Stud base qualification.
- G. Welding power setting recommendation by shear stud manufacturer.
- H. Shear Stud Layouts: Submit drawings showing the number, pattern, spacing and configuration of the shear studs for each beam and girder.
- I. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months.

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- J. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".

1.4 QUALITY ASSURANCE

- A. Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience.
- C. Welders and welding procedures to be qualified in accordance with AWS D1.1 and D1.3.

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. Refer to the latest edition of all referenced Standards and codes.
- B. American Iron and Steel Institute (AISI):
1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members (Latest Edition).
- C. American Society of Testing and Materials (ASTM):
1. A36/A36M-08 Standard Specification for Carbon Structural Steel
 2. A108-07 Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality
 3. A653/A653M-10 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- D. American Institute of Steel Construction (AISC):
1. Specification for Structural Steel Buildings - Allowable Stress Design and Plastic Design (Latest Edition)
 2. Load and Resistance Factor Design Specification for Structural Steel Buildings (Latest Edition)
- E. American Welding Society (AWS):
1. D1.1/D1.1M-10 Structural Welding Code - Steel
 2. D1.3/D1.3M-08 Structural Welding Code - Sheet Steel
- F. Military Specifications (Mil. Spec.):
1. MIL-P-21035B Paint, High Zinc Dust Content, Galvanizing Repair

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1.6 DELIVERY, STORAGE AND HANDLING:

- A. Deliver, store and handle decking in a manner to prevent damage or deformation.
- B. Cut plastic wrap to encourage ventilation.
- C. Store deck on dry wood sleepers; slope for positive drainage.

PART 2 - PRODUCTS**2.1 MATERIALS:**

- A. Steel Decking and all Flashings: ASTM A653, Structural Quality suitable for shear stud weld-through techniques.
- B. Galvanizing: ASTM A653, **G90**.
- C. Shear connector studs: ASTM A108, Grades 1015-1020, yield 350 Mpa (50,000 psi) minimum, tensile strength - 400 Mpa (60,000 psi) minimum, reduction of area 50 percent minimum. Studs of uniform diameter; heads shall be concentric and normal to shaft; stud, after welding free from any substance or defect which would interfere with its function as a shear connector. Studs shall not be painted or galvanized. Size of studs shall be as shown on drawings. Studs manufactured by a company normally engaged in the manufacturer of shear studs and can furnish equipment suitable for weld-through installation of shear studs.
- D. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- E. Miscellaneous Steel Shapes, Bearing Plates, Bent Plates and Angles: ASTM A36.
- F. Welding Materials: AWS D1.1; type for materials being welded. Electrodes to be low hydrogen type E7XTX, E7XTXX, or E70XXX as applicable.
- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
 - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
 - 2. Continuous sheet metal edging: at openings and concrete slab edges, unless otherwise detailed on drawings. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
 - 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the

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same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.

4. Seat angles for deck: Where a beam does not frame into a column.

2.2 REQUIREMENTS:

- A. Steel decking depth, gage, and section properties to be as shown on the drawings. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.
- B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. In combination with concrete slab, capable of supporting total design loads on spans shown.
- C. Steel decking capable of safely supporting total, normal construction service loads without damage to decking unit.

PART 3 - EXECUTION**3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Erect steel deck in accordance with manufacturer's printed instructions.
- E. Ship steel deck units to project in standard widths and cut to proper length.
- F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.
- G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastening. Bring each unit to proper bearing on supporting beams. Place deck units in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit. Maximum space between ends of abutting units is 13 mm (1/2 inch). If space exceeds 13 mm (1/2 inch), install closure plates at no additional cost to Government.
- H. Ceiling hanger loops, if used, must be flattened or removed to obtain bearing of units on structural steel.

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- I. Fasten deck units to structural steel as indicated on the drawings.
- J. Welding to conform to AWS D1.3 and done by competent experienced welding mechanics.
- K. Areas scarred during erection and welds shall be thoroughly cleaned and touched-up with zinc rich galvanizing repair paint. Paint touch-up is not required for welds or scars that are to be in direct contact with concrete.
- L. Provide metal concrete stops at edges of deck as required.
- M. Cutting and Fitting:
 - 1. Cut all metal deck units to proper length in the shop prior to shipping.
 - 2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
 - 3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.
 - 4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
 - 5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the VA COR. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
 - 6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as required for strength, continuity of decking and support of other work shown.
- N. Installation of shear connector studs through previously installed metal deck to conform to AWS D1.1, Section 7, except all studs will be installed with automatically timed welding equipment and as specified below:
 - 1. Do not place reinforcing steel temperature mesh or other materials and equipment which will interfere with stud installation on steel deck until shear connector studs are installed.
 - 2. Steel deck sheets shall be free of oil, rust, dirt, and paint. Release water in deck's valley so that it does not become entrapped between deck and beam. Surface to which stud is to be welded shall be clean and dry.
 - 3. Rest metal deck tightly upon top flange of structural member with bottom of deck rib in full contact with top of beam flange.
 - 4. Weld studs only through a single thickness of deck. Place decking so that a butt joint is obtained. Place studs directly over beam web,

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where one row of studs are required.

5. Ferrules specially developed for the weld-through technique must be used. Ferrules shall be appropriate for size of studs used and be removed after welding.
6. Submit report of successful test program for stud base qualification as required by AWS D1.1, Appendix K.
7. Space shear connector studs at 12 inches on center, unless otherwise noted.

3.2 CLEANING:

- A. Clean deck in accordance with manufacturer's recommendation before concrete placement.

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SECTION 05 40 00**COLD-FORMED METAL FRAMING****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:
 - 1. Exterior non-load-bearing steel stud curtain wall.

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. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- D. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- E. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.
- F. 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 withstand design loads without deflections greater than the following:
 - a. Exterior Non-load-Bearing Curtain wall: Lateral deflection of 1/240 of the wall height.

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3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 67 degrees C (120 degrees F).
4. Design framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
5. Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials. The design seismic lateral drift is as indicated on the structural drawings.
6. Engineering Responsibility: Engage a fabricator who assumes undivided responsibility for engineering cold-formed metal framing by employing a qualified professional engineer to prepare design calculations, shop drawings, and other structural data.
7. 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):

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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
 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).
 2. Flange Width:
 - a. Minimum 41 mm (1-5/8 inches).
 3. Web: Punched.

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- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
 - 1. Design Uncoated-Steel Thickness: Matching steel studs.
 - 2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

2.3 FRAMING ACCESSORIES:

- A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 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

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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
- 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.

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- 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.
- 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.

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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 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. Gratings
 - 3. Steel Counter or Bench Top Frame and Leg
 - 4. Support for roof eave element
 - 5. Miscellaneous short wall supports
 - 6. Reinforcement and Connections for Curtain Wall Assemblies
 - 7. Supports for Sunshade Louvers as necessary
 - 8. Miscellaneous sitework components

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. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Prime and finish painting: Section 09 91 00, PAINTING.
- E. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.
- F. 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:

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1. Grating, each type.
2. 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.

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

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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
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

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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.
- B. Railings and Handrails: 900 N (200 pounds) in any direction at any point.
- C. Floor Plates, Gratings, 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.

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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.

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,

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riveting or bolting.

2. Field riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes, for rivets and bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use Rivets and bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members' machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self-drilling and tapping screws or bolts.

E. Workmanship

1. General:
 - a. Fabricate items to design shown.
 - b. Furnish members in longest lengths commercially available within the limits shown and specified.
 - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
 - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
 - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
 - f. Prepare members for the installation and fitting of hardware.
 - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide

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reinforcement to support cut edges.

- h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.

2. Welding:

- a. Weld in accordance with AWS.
- b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
- c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
- d. Finish welded joints to match finish of adjacent surface.

3. Joining:

- a. Miter or butt members at corners.
- b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.

4. Anchors:

- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (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.

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- a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
 - b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
 - c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
 - d. Painted: AA-C22R10.
3. Steel and Iron: NAAMM AMP 504.
- a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
 - b. Surfaces exposed in the finished work:
 - 1) Finish smooth rough surfaces and remove projections.
 - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
 - c. Shop Prime Painting:
 - 1) Surfaces of Ferrous metal:
 - a) Items not specified to have other coatings.
 - b) Galvanized surfaces specified to have prime paint.
 - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
 - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
 - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.
 - 2) Non ferrous metals: Comply with MAAMM-500 series.
4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

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.

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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.
4. Steel hat channels where shown. Flange cut and flatted for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Trapeze Bars:

1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
3. Fabricate concealed components of structural steel shapes unless shown otherwise.
4. Stainless steel ceiling plate drilled for eye bolt.
5. Continuously weld connections where welds shown.
6. Use modular channel where shown with manufacturers bolts and fittings.
 - a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
 - b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.

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.

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- 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.
- G. Aluminum Bar Gratings:
 - 1. Fabricate grating and frame assembly from aluminum as shown in accordance with Metal Bar Grating Manual.
 - 2. Use 25 x 5 mm (1 x 3/16 inch) minimum size bearing bars.
 - 3. Mill finish unless specified otherwise.
 - 4. Use serrated bars for exterior gratings and interior gratings in the following areas:

2.7 LADDERS

- A. Steel Ladders:
 - 1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
 - 2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
 - 3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
 - 4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
 - 5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

2.8 RAILINGS

- A. In addition to the dead load design railing assembly to support live load specified.
- B. Fabrication General:
 - 1. Provide continuous welded joints, dressed smooth and flush.

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2. Standard flush fittings, designed to be welded, may be used.
 3. Exposed threads will not be approved.
 4. Form handrail brackets to size and design shown.
 5. Exterior Post Anchors.
 - a. Fabricate tube or pipe sleeves with closed ends or plates as shown.
 - b. Where inserts interfere with reinforcing bars, provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
 - c. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts. [**Base plates are not required on pipe sleeves where ornamental railings occur.**]
 6. Interior Post Anchors:
 - a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
 - b. Weld or thread flanged fitting to posts at base.
 - c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
 - d. Provide sliding flange base plate on posts secured with set screws.
 - e. Weld flange base plate to removable posts set in sleeves.
- C. Handrails:
1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
 2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.
- D. Steel Pipe Railings:
1. Fabricate of steel pipe with welded joints.
 2. Number and space of rails as shown.
 3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
 4. Form handrail brackets from malleable iron.
 5. Fabricate removable sections with posts at end of section.
 6. Removable Rails:
 - a. Provide "U" shape brackets at each end to hold removable rail as shown. Use for top and bottom horizontal rail when rails are joined together with vertical members.
 - b. Secure rail to brackets with 9 mm (3/8 inch) stainless steel through bolts and nuts at top rail only when rails joined with vertical members.
 - c. Continuously weld brackets to post.
 - d. Provide slotted bolt holes in rail bracket.

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- e. Weld bolt heads flush with top of rail.
- f. Weld flanged fitting to post where posts are installed in sleeves.
- 7. Opening Guard Rails:
 - a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
 - b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
 - c. Fabricate rails for floor openings for anchorage in sleeves.
- 8. Gates:
 - a. Fabricate from steel pipe as specified for railings.
 - b. Fabricate gate fittings from either malleable iron or wrought steel.
 - c. Hang each gate on suitable spring hinges of clamp on or through bolted type. Use bronze hinges for exterior gates.
 - d. Provide suitable stops, so that gate will swing as shown.
 - e. Provide padlock eyes where shown.
- 9. Chains
 - a. Chains: ASTM A391, Grade 63, straight link style, normal size chain bar 8 mm (5/16 inch) diameter, eight links per 25 mm (foot) and with boat type snap hook on one end, and through type eye bolt on other end.
 - b. Fabricate eye bolt for attaching chain to pipe posts, size not less than 9 mm (3/8 inch) diameter.
 - c. Fabricate anchor at walls, for engagement of snap hook of either a 9 mm (3/8 inch) diameter eye bolt or punched angle.
 - d. Galvanize chain and bolts after fabrication.

2.9 STEEL COUNTER OR BENCH TOP FRAME AND LEGS

- A. Fabricate channel or angle frame with mitered and welded corners as shown.
- B. Drill top of frame with 6 mm (1/4 inch) holes spaced 200 mm (8 inches) on center for securing countertop.
- C. Fabricate legs of angle or pipe shapes and continuously weld to frame.
- D. Finish frame with backed on enamel prime coat.

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

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is set.

2. Place in accordance with setting drawings and instructions.
 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, trap doors and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
1. Design and finish as specified for shop welding.
 2. Use continuous weld unless specified otherwise.
- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Power actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- F. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- G. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- H. Secure escutcheon plate with set screw.

3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts. unless shown otherwise.
 4. Secure steel plate or hat channels to studs as detailed.
- B. Ceiling Hung Toilet Stalls:
1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
 2. Bolt continuous steel angle at wall to masonry or weld to face of each metal stud.
 3. Secure brace for steel channels over toilet stall pilasters to wall angle supports with bolts at each end spaced as shown.
 4. Install diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
 5. Install stud bolts in lower flange of channel before installing furred

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down ceiling over toilet stalls.

6. Install support for ceiling hung pilasters at entrance screen to toilet room similar to toilet stall pilasters.

C. Supports for Wall Mounted items:

1. Locate center of support at anchorage point of supported item.
2. Locate support at top and bottom of wall hung cabinets.
3. Locate support at top of floor cabinets and shelving installed against walls.
4. Locate supports where required for items shown.

D. Support at Ceiling for X-ray Tube Stand and Radiographic Equipment:

1. Bolt modular steel channel frames to hangers as shown, anchored to structure above.
2. Fasten frames with modular channel manufacturers fittings, bolts, and nuts. Space modular channel supports and hangers as shown and as required to suit equipment furnished.
3. Install closure plates in channels at ceiling where channel opening is visible. Coordinate and cut plates to fit tight against equipment anchors after equipment anchors are installed.

E. 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.

F. 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.

3.3 GRATINGS

- A. Set grating flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.

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- B. Set frame in formwork before concrete is placed.
- C. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.
- D. Secure removable supporting members in place with stainless steel bolts.
- E. Bolt gratings to supports.

3.4 LADDERS

- A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.
- B. In elevator pits, set ladders to clear all elevator equipment where shown on the drawings.
 - 1. Where ladders are interrupted by division beams, anchor ladders to beams by welding, and to floors with expansion bolts.
 - 2. Where ladders are adjacent to division beams, anchor ladders to beams with bent steel plates, and to floor with expansion bolts.
- C. Ladder Rungs:
 - 1. Set ladder rungs into formwork before concrete is placed.[Build ladder rungs into masonry as the work progresses.]
 - 2. Set step portion of rung 150 mm (6 inches) from wall.
 - 3. Space rungs approximately 300 mm (12 inches) on centers.
 - 4. Where only one rung is required, locate it 400 mm (16 inches) above the floor.

3.5 RAILINGS

- A. Steel Posts:
 - 1. Secure fixed posts to concrete with expansion bolts through flanged fittings except where sleeves are shown with pourable grout.
 - 2. Install sleeves in concrete formwork.
 - 3. Set post in sleeve and pour grout to surface. Apply beveled bead of urethane sealant at perimeter of post or under flange fitting as specified in Section 07 92 00, JOINT SEALANTS—on exterior posts.
 - 4. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
 - 5. Secure sliding flanged fittings to posts at base with set screws.
 - 6. Secure fixed flanged fittings to concrete with expansion bolts.
 - 7. Secure posts to steel with welds.
- B. Aluminum Railing, Stainless Steel Railing, and Ornamental Railing Posts:

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1. Install pipe sleeves in concrete formwork.
2. Set posts in sleeve and pour grout to surface on exterior locations and to within 6 mm (1/4 inch) of surface for interior locations except to where posts are required to be removable.
3. Apply beveled bead of urethane sealant over sleeve at post perimeter for exterior posts and flush with surface for interior posts as specified in Section 07 92 00, JOINT SEALANTS.

C. Anchor to Walls:

1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
 - a. Anchor steel plate to concrete or solid masonry with expansion bolts.
 - b. Anchor steel plate to hollow masonry with toggle bolts.
2. Anchor flanged fitting with toggle bolt to steel support in frame walls.

D. Removable Rails:

1. Rest rails in brackets at each end and secure to bracket with stainless steel bolts and nuts where part of a continuous railing.
2. Rest rail posts in sleeves where not part of a continuous railing. Do not grout posts.

E. Gates:

1. Hang gate to swing as shown.
2. Bolt gate hinges to jamb post with clamp on or through bolts.

F. Chains:

1. Eye bolt chains to pipe posts.
2. Eye bolt anchoring at walls.
 - a. Expansion bolt to concrete or solid masonry.
 - b. Toggle bolt to hollow masonry of frame wall installed support.

G. Handrails:

1. Anchor brackets for metal handrails as detailed.
2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.
3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

3.6 STEEL COMPONENTS FOR MILLWORK ITEMS

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

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3.7 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.

3.8 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.

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SECTION 05 75 00**DECORATIVE FORMED METAL****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section Includes:
 - 1. Pre-fabricated metal column covers.

1.2 RELATED WORK

- A. Section 01 81 11 "Sustainable Design Requirements", for General sustainable design documentation requirements.
- B. 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.

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.
- B. Installer Qualifications: Fabricator of products.
- C. Mockups: Build a minimum 100 sq. ft. (10 sq. m.) mockups to verify

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selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

D. Preinstallation Conference: Conduct conference at Project site.

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.
- B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS**2.1 SHEET METAL**

- A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

2.2 PREFABRICATED METAL COLUMN COVERS - TYPE MTL-9

- A. Form column covers to shapes indicated from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that engages continuous mounting clips.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, 0.050 inch (1.27 mm) thick.

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- C. Fabricated from prefinished metal sheet, reinforce with concealed stiffeners, backing materials, or both, as needed.
- D. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Form returns at vertical joints to provide hairline V-joints.
- F. Fabricate column covers with hairline horizontal V-joints produced by forming returns on mating ends of column cover sections. Locate horizontal joints as indicated.
- G. Finish: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.
 - 1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work.
- B. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.
- C. Form metal to profiles indicated, in maximum lengths to minimize joints.
- D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.
 - 1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
- E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.
- F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

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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. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.
 - 1. 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.
- B. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

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. 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. Milled woodwork: Section 06 20 00, FINISH CARPENTRY.
- D. 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.

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- B. American Forest and Paper Association (AFPA):
 - 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 Anchors)

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- 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.
- E. Fire Retardant Treatment:
 - 1. Mil Spec. MIL-L-19140 with piece of treated material bearing

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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.

1.1 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.
- C. Plywood Backing for Electrical and Telecommunication Room:
 1. APA A-C EXT, Douglas Fir with A face exposed; fire-retardant treated (FRT) bearing identification mark indicating flame spread classification (25 or less per ASTM E84) issued by approval agency.
 2. Size: 19 mm (3/4 inch) thick.
 3. Paint plywood backing per Section 09 91 00, PAINTING. Leave FRT label unpainted.

2.2 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.

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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.
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.

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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.
- 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. Seats and benches
 - 2. Solid Polymer Counter and other Work Tops
 - 3. Miscellaneous Millwork
 - 4. Wood wall and ceiling systems not otherwise addressed.

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. Fabricated Metal brackets, bench supports and countertop legs: Section 05 50 00, METAL FABRICATIONS.
- D. Framing, furring and blocking: Section 06 10 00, ROUGH CARPENTRY.
- E. Color and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- F. Stock Casework: Section 12 32 00, MANUFACTURED WOOD CASEWORK.
- G. Electrical light fixtures and duplex outlets: Division 26, ELECTRICAL.

1.3 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).

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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

1.4 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.

1.5 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 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

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- 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
- 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

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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 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.

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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.Colors: As indicated
2. Plastic Laminate Plywood Cores:
 - a. Exterior Type, and species group.
 - b. Veneer Grade: A-C.

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.

2.6 ADHESIVE

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

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2.7 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, two pulls for drawers more than 24" wide; install with opening facing up with weep hole in bottom.
- 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.
- 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. 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

2.8 FABRICATION

- A. General:
 - 1. Except as otherwise specified, use AWI Custom Grade for architectural woodwork and interior millwork.
 - 2. Finish woodwork shall be free from pitch pockets.

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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, stainless steel, or plastic molded edge strips are shown or specified. Use plastic molded edge strips on 19 mm (3/4-inch) molded thick or thinner core material.
 - 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 decorative face does not occur.
- B. Seats and Benches:
1. Fabricate from 50 mm (2 inch) stock strips of plain-sawed White Oak, or Maple.
 2. Solid seats securely glued together of spliced, doweled, or double tongued and grooved wood pieces. Where open joints are indicated, work each wood piece from solid stock.
 3. Round top edges and corners where exposed.
- C. 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 plastic or 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.

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- a. Make corners and joints hairline; slightly bevel arises.
 - b. Provide cutouts for inserts, fixtures and fittings; verify locations from on-site dimensions.
 - c. Splashes and edges as indicated.
3. Fabricate wood counter for work benches as shown.

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.
 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.
 8. Exterior Work: Joints shall be close fitted, metered, tongue and grooved, rebated, or lapped to exclude water and made up in thick white lead paste in oil.
- B. Seats and Benches:
 1. Use stainless steel countersunk screws to secure wood seats to brackets, angle, or pipe supports.
 2. Use stainless steel or chrome plated steel bolts for anchorage to walls. Use 6 mm (1/4 inch) toggle bolts in steel stud walls and hollow masonry. Use 6 mm (1/4 inch) expansion bolts in solid masonry or

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concrete.

3. Wall Benches: Support within 150 mm (6 inches) near ends and not over 900 mm (3 feet) on centers with stainless steel bar brackets under bench secured to seat and wall.
 4. Corner Seats: Support on continuous angles secured to seat and walls.
 5. Freestanding Benches: Support within 200 mm (8 inches) of ends and not over 900 mm (3 feet) on centers with pipe bench supports.
- C. Communication Center Counters and Interview Booths:
1. Secure framing to floor with expansion bolts.
 2. Secure counter top to support with wood cleats or metal angles screwed on 150 mm (6 inch) centers.
 3. Conceal fasteners on corridor side. Exposed fasteners permitted under counter top and in knee spaces on staff side.
- D. 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.
- E. 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

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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 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.

F. 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.

G. 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.

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SECTION 07 13 26**SELF-ADHERING SHEET WATERPROOFING****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Section Includes:
 - 1. Bonded HDPE sheet waterproofing.

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. Integration and termination with modified bituminous sheet waterproofing: Section 07 13 52, MODIFIED BITUMINOUS SHEET WATERPROOFING.
- D. Integration and termination with weather-resistive barrier system; Section 07 27 13, MODIFIED BITUMINOUS SHEET AIR BARRIERS.

1.3 MANUFACTURER'S QUALIFICATIONS:

- A. Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:
 - 1. Manufacturer regularly and presently manufactures bituminous sheet waterproofing as one of its principal products.
 - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.
 - 3. Manufacturer's product submitted has been in satisfactory and efficient operation on three similar installations for at least three years.
 - 4. Submit list of installations, include name and location of project and name of owner.

1.4 INSTALLER QUALIFICATIONS:

- A. An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer with a minimum of 5 years successful experience in projects of similar scope.
 - 1. Provide written certification from waterproofing membrane manufacturer that installer is certified by the manufacturer to install the waterproofing system for this application.

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1.5 QUALITY ASSURANCE

- A. Provide on-site inspection by waterproofing manufacturer's representative and Contracting Officer's Representative of the waterproofing work during construction to provide a method for accepting completed work and to confirm that the work complies with the contract documents.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Bonded HDPE sheet waterproofing.
 - 2. Protection material, temporary and permanent.
 - 3. Printed installation instructions for conditions specified.
- C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- D. Certificates:
 - 1. Approval of installer by bonded HDPE sheet waterproofing manufacturers.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

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

1.8 ENVIRONMENTAL REQUIREMENTS:

- A. Ambient Surface and Material Temperature: Not less than 4 degrees C (40 degrees F), during application of waterproofing.

1.9 WARRANTY:

- A. Warrant HDPE sheet waterproofing materials and installation against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period is ten years.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by basic designation only.

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PART 2 - PRODUCTS**2.1 BONDED HDPE SHEET WATERPROOFING**

- A. Bonded HDPE Sheet for Vertical Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of a HDPE film coated with a pressure-sensitive adhesive and protective release liner, total 32-mil (0.8-mm) thickness; with the following physical properties:
1. Tensile Strength, Film: 4000 psi (27.6 MPa) minimum; ASTM D 412.
 2. Low-Temperature Flexibility: Pass at minus 10 deg F (minus 23 deg C); ASTM D 1970.
 3. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D 903, modified.
 4. Lap Adhesion: 2.5 lbf/in. (440 N/m) minimum; ASTM D 1876, modified.
 5. Hydrostatic-Head Resistance: 231 feet (70 m); ASTM D 5385, modified.
 6. Puncture Resistance: 100 lbf (445 N) minimum; ASTM E 154.
 7. Water Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 8. Water Absorption: 0.5 percent maximum; ASTM D 570.
- B. Bonded HDPE Sheet for Horizontal Applications: Uniform, flexible, multilayered-composite sheet membrane consisting of either an HDPE film coated with pressure-sensitive adhesive and protective release liner, total 46-mil (1.2-mm) thickness; with the following physical properties:
1. Tensile Strength, Film: 2000 psi (13.8 MPa) minimum; ASTM D 412.
 2. Low-Temperature Flexibility: Pass at minus 10 deg F (minus 23 deg C); ASTM D 1970.
 3. Peel Adhesion to Concrete: 5 lbf/in. (875 N/m) minimum; ASTM D 903, modified.
 4. Lap Adhesion: 2.5 lbf/in. (440 N/m) minimum; ASTM D 1876, modified.
 5. Hydrostatic-Head Resistance: 231 feet (70 m); ASTM D 5385, modified.
 6. Puncture Resistance: 200 lbf (890 N) minimum; ASTM E 154.
 7. Water Vapor Permeance: 0.01 perms (0.6 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
 8. Water Absorption: 0.5 percent maximum; ASTM D 570.

2.2 PROTECTION MATERIAL

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding 0.15-mm (No. 100 sieve) laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 200 L/min. per m (16 gpm per ft.).

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- B. High-Capacity, Molded-Sheet Collector-Panel System: Composite subsurface collector-panel system by same manufacturer as primary molded-sheet drainage panels; consisting of a high-profile, studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding 0.15-mm (No. 100 sieve) laminated to one side of the core; and with a vertical flow rate of 200 to 1250 L/min. per m (16 to 100 gpm per ft.). Provide system with manufacturer's outlets, connectors, tapes, and other accessories to connect primary molded-sheet drainage panels with piped subdrainage system specified in Section 334600 "Subdrainage."

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
- B. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- C. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, for compliance with requirements and other conditions affecting performance of the waterproofing.
 - 1. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

3.3 BONDED HDPE SHEET-WATERPROOFING APPLICATION

- A. Install bonded HDPE sheets according to manufacturer's written instructions.
- B. Place and secure molded-sheet drainage panels over substrate. Lap edges and ends of geotextile to maintain continuity.
- C. Vertical Applications: Install sheet with HDPE face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation. Mechanically fasten to substrate.

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1. Securely fasten top termination of membrane with continuous metal termination bar anchored into substrate and cover with detailing tape.
- D. Horizontal Applications: Install sheet with HDPE or polyethylene face against substrate. Accurately align sheets and maintain uniform side and end laps of minimum dimensions required by membrane manufacturer. Overlap and seal seams, and stagger and tape end laps to ensure watertight installation.
- E. Corners: Seal lapped terminations and cut edges of sheet waterproofing at inside and outside corners with detail tape.
- F. Seal penetrations through sheet waterproofing to provide watertight seal with detail tape patches or wraps and a liquid-membrane troweling.
- G. Install sheet-waterproofing and auxiliary materials to produce a continuous watertight tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Tape perimeter of damaged or nonconforming area extending 6 inches (150 mm) beyond repaired areas in all directions. Apply a patch of sheet waterproofing and firmly secure with detail tape.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 PROTECTION, REPAIR, AND CLEANING

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

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SECTION 07 13 52**MODIFIED BITUMINOUS SHEET WATERPROOFING****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. This section specifies modified bituminous sheet material used for exterior below grade waterproofing and split slab waterproofing.

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. Integration and termination with HDPE bonded sheet waterproofing: Section 07 13 26, SELF-ADHERING SHEET WATERPROOFING.
- D. Integration and termination with weather-resistive barrier system; Section 07 27 13, MODIFIED BITUMINOUS SHEET AIR BARRIERS.

1.3 MANUFACTURER'S QUALIFICATIONS:

- A. Approval by Contracting Officer is required of products and services of proposed manufacturers, and installers, and will be based upon submission by Contractor that:
 - 1. Manufacturer regularly and presently manufactures bituminous sheet waterproofing as one of its principal products.
 - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items.
 - 3. Manufacturer's product submitted has been in satisfactory and efficient operation on three similar installations for at least three years.
 - 4. Submit list of installations, include name and location of project and name of owner.

1.4 INSTALLER QUALIFICATIONS:

- A. An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer with a minimum of 5 years successful experience in projects of similar scope.
 - 1. Provide written certification from waterproofing membrane manufacturer that installer is certified by the manufacturer to install the waterproofing system for this application.

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1.5 QUALITY ASSURANCE

- A. Provide on-site inspection by waterproofing manufacturer's representative and Contracting Officer's Representative of the waterproofing work during construction to provide a method for accepting completed work and to confirm that the work complies with the contract documents.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Bituminous sheet.
 - 2. Primer.
 - 3. Liquid membrane.
 - 4. Protection material, temporary and permanent.
 - 5. Printed installation instructions for conditions specified.
- C. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.
- D. Certificates:
 - 1. Indicating bituminous sheet manufacturer's approval of primer, and roof cement.
 - 2. Indicating bituminous sheet waterproofing manufacturer's qualifications as specified.
 - 3. Approval of installer by bituminous sheet manufacturers.
 - 4. Water test report.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING:

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

1.8 ENVIRONMENTAL REQUIREMENTS:

- A. Ambient Surface and Material Temperature: Not less than 4 degrees C (40 degrees F), during application of waterproofing.

1.9 WARRANTY:

- A. Warrant bituminous sheet waterproofing installation against moisture leaks and subject to terms of "Warranty of Construction", FAR clause 52.246-21,

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except that warranty period is five years.

1.10 APPLICABLE PUBLICATIONS:

- A. Publications listed below form a part of this specification to the extent referenced. Publications are referenced by basic designation only.
- B. Federal Specifications (Fed. Spec.):
 - 1. UU-B-790A Building Paper, Vegetable Fiber: (Kraft, Water-
 - 2. INT AMD 1 Proof, Water Repellent and Fire Resistant)
- C. American Society for Testing and Materials (ASTM):
 - 1. C578-10 Rigid Cellular Polystyrene Thermal Insulation
 - 2. D41-11 Asphalt Primer Used in Roofing, Dampproofing and Waterproofing
 - 3. D2822-05 Asphalt Roof Cement
 - 4. D6380-03(R2009) Asphalt Roll Roofing (Organic Felt)
- D. American Hardboard Association (AHA):
 - 1. A135.4-1995 Basic Hardboard

PART 2 - PRODUCTS**2.1 BITUMINOUS SHEET:**

- A. Cold applied waterproofing membrane composed primarily of modified bituminous material prefabricated in sheet form designed for below grade exterior and split slab waterproofing. Sheet reinforced with fibers at manufacturer's option.
- B. Thickness of Bituminous Sheet: 1.5 mm (60 mils), plus or minus 0.13 mm (5 mils), and bonded to a 0.1 mm (4 mil) thick plastic sheet.
- C. Provide with a release sheet to prevent bonding of bituminous sheet to itself.
- D. Physical Properties:
 - 1. Tensile Strength, Membrane: 2.24 MPa (325 psi) minimum; ASTM D 412, Die C, modified.
 - 2. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - 3. Low-Temperature Flexibility: Pass at minus 32 deg C (minus 25 deg F); ASTM D 1970.
 - 4. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
 - 5. Puncture Resistance: 222 N (50 lbf) minimum; ASTM E 154.

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6. Water Absorption: 0.1 percent weight-gain maximum after 48-hour immersion at 21 deg C (70 deg F); ASTM D 570.
7. Water Vapor Permeance: 2.9 ng/Pa x s x sq. m (0.05 perms) maximum; ASTM E 96/E 96M, Water Method.

2.2 PRIMER:

- A. Furnished by manufacturer of bituminous sheet as required for particular application in accordance with sheet manufacturer's instructions.
- B. Primer: ASTM D41; Low VOC primer in solvent specially formulated to provide good adhesion of bituminous sheet waterproofing membrane to concrete substrate.
 1. VOC Content: Coatings shall comply with VOC content limits of Bay Area Air Quality Management District (BAAQMD) Regulation 8, Rule 3, Architectural Coatings, effective January 1, 2011; and the following VOC limits when calculated according to 40 CFR 59, Subpart D (EPA Method 24); whichever is more stringent:
 - a. VOC Content: Less than 200 g/L.

2.3 PROTECTION MATERIAL:

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding 0.15-mm (No. 100 sieve) laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 200 L/min. per m (16 gpm per ft.).
- B. High-Capacity, Molded-Sheet Collector-Panel System: Composite subsurface collector-panel system by same manufacturer as primary molded-sheet drainage panels; consisting of a high-profile, studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding 0.15-mm (No. 100 sieve) laminated to one side of the core; and with a vertical flow rate of 200 to 1250 L/min. per m (16 to 100 gpm per ft.). Provide system with manufacturer's outlets, connectors, tapes, and other accessories to connect primary molded-sheet drainage panels with piped subdrainage system specified in Section 334600 "Subdrainage."

2.4 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
- B. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- C. Metal Termination Bars: Aluminum bars, approximately 25 by 3 mm (1 by 1/8 inch) thick, predrilled at 229-mm (9-inch) centers.

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PART 3 - EXECUTION**3.1 PREPARATION:**

A. Surface Condition:

1. Before applying waterproofing materials, ensure concrete and masonry surfaces are fully cured, smooth, clean, dry, and free from high spots, depressions, loose and foreign particles and other deterrents to adhesion.
2. Fill voids, joints, and cracks with patching compound.

B. Concrete surfaces cured a minimum of seven days, free from release agents, concrete curing agents, and other contaminants.

3.2 APPLICATION:

A. Priming:

1. Prime concrete surfaces.
2. Application method, amount of primer and condition or primer before installation of bituminous sheet as recommended by primer manufacturer.
3. Reprime when required in accordance with manufacturer's instructions.

B. Bituminous Sheet Installation:

1. Remove release sheet prior to application.
2. Lay bituminous sheet from low point to high point so that laps shed water.
3. Treat expansion, construction and control joints and evident working cracks as expansion joints. Apply bituminous sheet in double thickness over joint by first applying a strip of bituminous sheet not less than 200 mm (8 inches) wide, centered over joint.
4. Lap seams not less than 150 mm (6 inches).
5. Lay succeeding sheet with laps, and hand roll with a roller.
6. Repair misaligned or inadequately lapped seams in accordance with manufacturer's instructions.
7. Seal seams and terminations in accordance with sheet manufacturer's instructions. Treat all seams, laps, and edges with 6 mm by 25 mm (1/4 inch by 1 inch) troweling of liquid membrane.

C. Corner Treatment:

1. At inside and outside corners apply double cover using an initial strip not less than 300 mm (12 inches) wide, centered along axis of corner.
2. Cover each strip completely by the regular application of bituminous sheet.
3. Provide a fillet or cant on inside corners.
4. Form cants using patching compound

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- a. Do not use wood, fiber, and insulating materials for cants.

D. Top Edge Treatment:

- 1. Provide a termination bar at the top edge of the membrane coated with liquid membrane.
- 2. Integrate the top edge of the membrane with the wall resistive barrier system to provide continuity from below-grade to above-grade. Provide a stainless steel counter flashing where waterproof membrane is exposed at grade.

E. Projection Treatment:

- 1. Apply a double layer of bituminous sheet around pipes and similar projections at least 150 mm (6 inches) wide.
- 2. At drains, apply a bead of roof cement over a double layer of bituminous sheet under clamping rings.

3.3 PROTECTION:

- A. Protect bituminous sheet before backfill or wearing courses are placed.
- B. Install protection material and hold in place in accordance with instructions of manufacturer of waterproofing materials.
- C. Temporary Protection:
 - 1. When waterproofing materials are subjected to damage by sunlight and can not be immediately protected as specified, protect waterproofing materials by waterproof building paper or suitable coating approved by manufacturer of waterproofing system used.

3.4 PATCHING:

- A. Repair tears, punctures, air blisters, and inadequately lapped seams, in accordance with manufacturer's instructions before protection course is applied.

3.5 INSPECTION:

- A. Do not cover waterproofed surfaces by other materials or backfill until work is approved by Contracting Officer's Representative.

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 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. 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. 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):

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1. C270-08 Mortar for Unit Masonry
2. C516-08 Vermiculite Loose Fill Thermal Insulation
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

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Polyisocyanurate/polyurethane	
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

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of length to extend beyond insulation and retain cap washer when washer is placed on the pin.

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.

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- 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 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.
- F. Where sound deadening board is shown, secure[**with adhesive to masonry or concrete walls**][**and**][**with screws to metal or wood framing**]. Secure sufficiently in place until subsequent cover is installed. Seal all cracks with caulking.

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 ready to receive roofing or waterproofing membrane.
- B. Repairs and alteration work to existing roof insulation.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- C. Wood cants, blocking, and edge strips: Section 06 10 00, ROUGH CARPENTRY.
- D. Perimeter, rigid, and batt or blanket insulation not part of roofing system: Section 07 21 13, THERMAL INSULATION.
- E. Sheet metal components and wind uplift requirements for roof-edge design: Section 07 60 00, FLASHING AND SHEET METAL.
- F. 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

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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
 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.

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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.
- 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.

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1. Nailers, cants, and terminations.
2. Layout of insulation showing slopes, tapers, penetration, and edge conditions.

E. Samples:

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

F. Certificates:

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

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

H. Layout of tapered roof system showing units required.

I. Documentation of supervisors' and inspectors' qualifications.

1.7 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

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approved by roofing manufacturer and listed as component of FM Approvals-approved roofing system.

- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Roof Insulation System:
 - 1. Fabricate of 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.

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

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- 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" 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 26 13.13**CONCRETE SLAB APPLIED VAPOR RETARDER****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Section includes water vapor retarders applied on concrete floor slab scheduled to receive floor finishes, which do not meet the water vapor emission limits specified.

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. Section 03 30 00 "Cast-in-Place Concrete" for concrete floor slab.
- D. Section 09 65 16 "Resilient Sheet Flooring" for concrete floor slab water vapor emission limits for resilient sheet flooring.
- E. Section 09 65 19 "Resilient Tile Flooring" for concrete floor slab water vapor emission limits for resilient tile flooring.
- F. Section 096800 "Carpeting" for concrete floor slab water vapor emission limits for tile carpeting.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Product Data: Include product performance characteristics, test reports, and application instructions.
- C. LEED Submittals:
 - 1. Product Data for Credit IEQ 4.2: For applied vapor retarder, including printed statement of VOC content.
- D. Qualification Data: For Applicator.
- E. Product Test Reports: For applied vapor retarder, for tests performed by a qualified testing agency acceptable to the Contracting Officer's Representative.
 - 1. ASTM E 96/96 M, *Standard Test Methods for Water Vapor Transmission of Materials*, Water Method.

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2. ASTM D 1308, *Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes*; minimum 14 days.
3. ASTM D 4541, *Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers*.
4. ASTM D 7234, *Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers*.

F. Field quality-control reports.

G. Certifications: Furnish written certification that the manufacturer has verified the compatibility between the vapor retarder provided and the flooring product scheduled to be applied, including adhesives and floor leveling materials.

H. Sample Warranty: For manufacturer's special warranty.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver liquid materials to Project site in original containers with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, shelf life, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by manufacturer.

C. Remove and replace liquid materials that cannot be applied within their stated shelf life.

D. Protect stored materials from direct sunlight.

1.6 WARRANTY

A. Concrete slab applied vapor retarders are subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is extended to ten years.

B. Manufacturer's Special Warranty: Manufacturer and Installer agree to repair or replace the applied concrete vapor retarder, the new floor covering or coating, including materials and labor for applied concrete vapor retarder that fails to remain adhered to the substrate or is affected by moisture or alkalinity within the specified warranty period. Manufacturer's warranty requires manufacturer's inspection and written authorization, prior to removal of existing floor covering and applied concrete vapor retarder.

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PART 2 - PRODUCTS**2.1 MATERIALS, GENERAL**

- A. Compatibility: Provide vapor retarders that are compatible with adhesives and floor covering scheduled to be applied on top of the vapor retarder, and with floor leveling products required for flooring installation, as demonstrated by vapor retarder manufacturer, based on testing and field experience.
- B. VOC Content: Products shall comply with VOC limits of Bay Area Air Quality Management District (BAAQMD), Reg. 8, Rule 3, effective 01/01/2011 and LEED-NC, whichever is more stringent, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Sealers: 100 g/L.

2.2 VAPOR RETARDERS

- A. Performance Requirements:
 - 1. Permeance: Maximum 0.3 perms (0.209 g/h·m²), when tested in accordance with ASTM E 96 (water method).
 - 2. Alkalinity Resistance: Unaffected by a pH of 14 when tested in accordance with ASTM D 1308, minimum 14 days.
 - 3. May be installed on concrete with moisture vapor emission rates of up to 20 lbs of water per 1000 sq. ft. in 24 hours (334 ng/Pa·s·m²), when tested in accordance with ASTM F 1869, anhydrous calcium chloride test; and up to 95% relative humidity when tested in accordance with ASTM F 2170, in situ hygrometer probe test.
 - 4. Adhesion to concrete: 500 psi (3,450 KPa) or greater, as tested in accordance with ASTM D 4541 or ASTM D 7234.

2.3 RELATED MATERIALS

- A. Primers and Cement Topcoat: Where primers and cement topcoats are necessary for floor finishing installation, use primer and cement-based underlayment products recommended by vapor retarder manufacturer.
- B. Concrete Testing Equipment: Subject to compliance with requirements, provide the following products by American Moisture Test, Inc.:
 - 1. Calcium Chloride Moisture Test Kit for ASTM F 1869.
 - 2. In-Situ Relative Humidity Meter and Probe for ASTM F 2170.
 - 3. Digital Ph Meter for ASTM F 2170.
 - 4. Infrared surface temperature meter.

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PART 3 - EXECUTION**3.1 EXAMINATION****A. Water Vapor Emission Testing:**

1. Perform pre-installation testing of the concrete slab prior to the application of applied vapor retarder. Testing shall be performed by a qualified testing personnel and testing laboratory.
2. Condition the area to be tested for at least 48 hours prior to testing to allow the concrete slab to reach equilibrium with the building's ambient conditions at the service temperature and humidity expected during normal operation. Maintain the temperature and relative humidity for the duration of the testing.

B. Perform three tests for the first 1000 sq. ft. (92.9 m2) of flooring. Add one test for each additional 1000 sq. ft. (92.9 m2) or fraction thereof. Conduct tests around the perimeters of the room, at columns, and where moisture may be evident.**1. Moisture:**

- a. Perform ASTM F 1869 anhydrous calcium chloride testing on clean concrete slabs when required by flooring finish manufacturer; free of curing, sealing, adhesive residue, water and surface contaminates in an area 20 inches by 20 inches (508 mm by 508 mm), 24-hours before test kits are installed.
- b. Perform ASTM F 2170 in situ hygrometer probe test at depth of 40% slab thickness for concrete slab that is allowed to dry from top only, and at depth of 20% of slab thickness for concrete slab that is allowed to dry from top and bottom.

2. Alkalinity: Perform ASTM F 710 alkalinity testing during retrieval of moisture tests, directly inside dome area by placing several drops of manufacturer provided solution to concrete surface. Wait 60-seconds and apply digital LCD pH meter. Record results to the nearest hundredth on final test report.**3. Temperature, Humidity and Surface Thermometer: Document temperature, humidity and surface temperature before testing at installation of kits or probe sleeves, and on final testing report.****4. Temperature and Humidity Data Logger: Install a data logger to document temperature and humidity before testing at installation of kits or probe sleeves, and on final testing report.****5. Infrared Surface Thermometer: Document concrete surface temperature at start of testing and at end of testing. Provide results on testing report.****6. Record on finish floor plans the number and location of tests conducted on concrete surface.****3.2 SURFACE PREPARATION****A. Concrete surfaces to be tested shall be clean and free of residue, debris, and sealing compounds.**

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- B. Shot blast concrete surfaces to International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) 3 to 4.
- C. Diamond-grind concrete surface near wall base, edges, and corners.
- D. Sweep and vacuum clean substrates as required, immediately before application of vapor retarder.

3.3 APPLICATION

- A. Apply vapor retarder by squeegee, spray, and/or roller method to saturate the concrete surface. Apply materials in accordance with manufacturer's instructions.
- B. Coverage rates shall be in accordance with manufacturer's recommendations based on concrete density and porosity.
- C. Allow materials to penetrate and cure. Re-test substrate and re-apply vapor retarder if areas exceed the following:
 - 1. ASTM F 1869 (as modified to exclude removal of surface finish): Water vapor emission not to exceed 3.0 lb of water/1000 sq. ft. (50 ng/Pa·s·m²) in 24 hours.
 - 2. ASTM F 710: No reaction to up to 9.0 pH alkali solution.

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 27 13**MODIFIED BITUMINOUS SHEET AIR BARRIERS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This Section includes self-adhering, vapor-retarding, modified bituminous sheet air barriers.
- B. Related Sections include the following:
 - 1. Sustainable design requirements and procedures including submittal requirements: Section 01 81 11, SUSTAINABLE DESIGN REQUIREMENTS.
 - 2. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
 - 3. Sheet metal flashings: Section 07 60 00, FLASHING AND SHEET METAL.
 - 4. Joint-sealant materials and installation: Section 07 92 00, JOINT SEALANTS.

1.2 DEFINITIONS

- A. ABAA: Air Barrier Association of America.
- B. Air Barrier Assembly: The collection of air barrier materials and auxiliary materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

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. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of air barrier.

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- C. Shop Drawings: Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strip, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
 - 1. Include details of interfaces with other materials that form part of air barrier.
- D. Product Certificates: For air barriers, certifying compatibility of air barrier and accessory materials with Project materials that connect to or that come in contact with air barrier; signed by product manufacturer.
- E. Qualification Data: For Applicator.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for air barriers.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: A firm experienced in applying air barrier materials similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Include installers of other construction connecting to air barrier, such as roofing, waterproofing, architectural precast concrete, masonry, joint sealants, windows, glazed curtain walls, and door frames.
 - 2. Review air barrier requirements including surface preparation, substrate condition and pretreatment, minimum substrate curing period, forecasted weather conditions, special details and sheet flashings, mockups, installation procedures, sequence of installation, testing and inspecting procedures, and protection and repairs.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air barrier manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Store rolls according to manufacturer's written instructions.
- D. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air barrier manufacturer.

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Protect substrates from environmental conditions that affect performance of air barrier. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS**2.1 SELF-ADHERING SHEET AIR BARRIER**

- A. Modified Bituminous Sheet: 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick, polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.

1. Physical and Performance Properties:

- a. Membrane Air Permeance: Not to exceed 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. (0.02 L/s x sq. m of surface area at 75-Pa) pressure difference; ASTM E 2178.
- b. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
- c. Ultimate Elongation: 200 percent minimum; ASTM D 412, Die C, modified.
- d. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
- e. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
- f. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
- g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
- h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended by air barrier manufacturer for intended use and compatible with air barrier. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of air barrier material.
- C. Counterflashing Strip: Modified bituminous 40-mil- (1.0-mm-) thick, self-adhering sheet consisting of 32 mils (0.8 mm) of rubberized asphalt laminated to an 8-mil- (0.2-mm-) thick, crosslaminated polyethylene film with release liner backing.
- D. Butyl Strip: Vapor-retarding, 30- to 40-mil- (0.76- to 1.0-mm-) thick, self adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive, with release liner backing.

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- E. Modified Bituminous Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- F. Termination Mastic: Cold fluid-applied elastomeric liquid; trowel grade.
- G. Substrate Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0250 inch (0.64 mm) thick, and Series 300 stainless-steel fasteners.
- J. Sprayed Polyurethane Foam Sealant: 1- or 2-component, foamed-in-place, polyurethane foam sealant, 1.5 to 2.0 lb/cu. ft. (24 to 32 kg/cu. m) density; flame spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.
- K. Modified Bituminous Transition Strip: Vapor-retarding, 40-mil- (1.0-mm-) thick, smooth-surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.
- L. Elastomeric Flashing Sheet: ASTM D 2000, 2BC415 to 3BC620, minimum 50- to 65-mil- (1.3- to 1.6-mm-) thick, cured sheet neoprene with manufacturer's recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- M. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
- N. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low-modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Division 07 Section "Joint Sealants."

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air barrier manufacturer.

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3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
 1. Install modified bituminous strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm).
- G. Bridge and cover expansion joints discontinuous deck-to-wall and deck-to-deck joints with overlapping modified bituminous strips.
- H. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- I. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 INSTALLATION

- A. Install modified bituminous sheets according to air barrier manufacturer's written instructions and according to recommendations in ASTM D 6135.
 1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous air barrier sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

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- B. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install modified bituminous strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of termination mastic on horizontal inside corners.
- C. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations with termination mastic and according to ASTM D 6135.
- D. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by air barrier sheet in same day. Reprime areas exposed for more than 24 hours.
 - 1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- E. Apply and firmly adhere modified bituminous sheets horizontally over area to receive air barrier sheets. Accurately align sheets and maintain a uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure airtight installation.
 - 1. Apply sheets in a shingled manner to shed water without interception by any exposed sheet edges.
 - 2. Roll sheets firmly to enhance adhesion to substrate.
- F. Apply continuous modified bituminous sheets over modified bituminous strips bridging substrate cracks, construction, and contraction joints.
- G. Seal top of through-wall flashings to air barrier sheet with an additional 6-inch- (150-mm-) wide, modified bituminous strip.
- H. Seal exposed edges of sheets at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- I. Install air barrier sheets and auxiliary materials to form a seal with adjacent construction and to maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates.
- J. Connect and seal exterior wall air barrier membrane continuously to roofing membrane air barrier, concrete below-grade structures, floor-to floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings using accessory materials as indicated.

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- K. Wall Openings: Prime concealed perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip elastomeric flashing sheet preformed silicone-sealant extrusion so that a minimum of 3 inches (75 mm) of coverage is achieved over both substrates. Maintain 3 inches (75 mm) of full contact over firm bearing to perimeter frames with not less than 1 inch (25 mm) of full contact.
 - 1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
- L. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of air barrier membrane with foam sealant.
- M. At end or each working day, seal top edge of membrane to substrate with termination mastic.
- N. Apply joint sealants forming part of air barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- O. Repair punctures, voids, and deficient lapped seams in air barrier. Slit and flatten fishmouths and blisters. Patch with air barrier sheet extending 6 inches (150 mm) beyond repaired areas in all directions.
- P. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- Q. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air barrier components.

3.4 CLEANING AND PROTECTION

- A. Protect air barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 - 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. Remove and replace air barrier exposed to these conditions for more than 30 days.
 - 2. Protect air barrier from contact with creosote, uncured coal-tar products, TPO, EPDM, flexible PVC membranes, and sealants not approved by air barrier manufacturer.
- B. Clean spills, stains, and soiling from adjacent construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

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.

- - - E N D - - -

SECTION 07 42 43**COMPOSITE WALL PANELS****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. Section includes metal-faced composite wall panels.

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. Section 05 40 00, COLD-FORMED METAL FRAMING, for cold-formed metal framing supporting metal-faced composite wall panels.
- D. Section 07 42 19, METAL PLATE WALL PANELS, for through-the-face-fastened metal wall panels and metal soffit and fascia panels.
- E. Section 07 60 00, FLASHING AND SHEET METAL, "Sheet Metal Flashing and Trim" for field-formed flashings and other sheet metal work not part of metal-faced composite wall panel assemblies.

1.3 DEFINITION

- A. Metal-Faced Composite Wall Panel Assembly: Metal-faced composite wall panels, attachment system components, miscellaneous metal framing, and accessories necessary for a complete weathertight wall system.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Metal-faced composite wall panel assemblies shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Air Infiltration: Air leakage through assembly of not more than [0.06 cfm/sq. ft. (0.3 L/s per sq. m)] of wall area when tested according to ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).
- C. Water Penetration Under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).
- D. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and

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stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:
 - a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.
 - b. Uniform pressure as indicated on Drawings.
 2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces, or as recommended and accepted by manufacturer if higher.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal-faced composite wall panel and accessory.
- B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.
1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):
 - a. Flashing and trim.
 - b. Anchorage systems.
- C. Samples for Initial Selection: For each type of metal-faced composite wall panel indicated with factory-applied color finishes.
1. Include similar Samples of trim and accessories involving color selection.
 2. Include manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each sealant exposed to view.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
1. Metal-Faced Composite Wall Panels: Minimum 12 x 12 inches (300 x 300

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mm). Include fasteners, closures, and other metal-faced composite wall panel accessories.

a. Composite Panels: Include four-way joint.

2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.
4. Exposed Gaskets: 12 inches (300 mm) long.
5. Exposed Sealants: For each type and color of joint sealant required. Install joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of metal-faced composite wall panels adjacent to joint sealants.

1.6 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Wall panels and attachments.
 2. Stud Framing.
 3. Structural elements.
 4. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 5. Penetrations of wall by pipes and utilities.
- B. Qualification Data: For professional engineer and testing agency.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For metal wall panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Source Limitations: Obtain each type of metal-faced composite wall panel from single source from single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit samples of materials that will contact joint sealants to joint-sealant manufacturers for testing indicated in subparagraphs below:
 1. Use manufacturer's standard test methods to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

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- a. Perform tests under environmental conditions replicating those that will exist during installation.
 2. Submit no fewer than nine pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 3. Schedule enough time for testing and analyzing results to prevent delaying the Work.
 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures, including use of specially formulated primers.
- D. Fire-Resistance Ratings: Where indicated, provide metal-faced composite wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
1. Build mockup of typical **wall, corner panel, including soffit**, as shown on Drawings; approximately **one bay wide by one story high** by full thickness, including supports, attachments, and accessories.
 - a. Include four-way joint for metal-faced composite wall panels.
 - b. Built mock-up may be incorporated into the final product at the discretion of the Contracting Officer's Representative.
 2. Conduct water-spray test of mockup of metal-faced composite wall panel assembly, testing for water penetration according to AAMA 501.2.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion, at the Contracting Officer's Representative's discretion.
- F. Preinstallation Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal-faced composite wall panel Installer, metal-faced composite wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal-faced composite wall panels including installers of doors, windows, and louvers.
 2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review methods and procedures related to metal-faced composite wall panel installation, including manufacturer's written instructions.

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4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal-faced composite wall panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal-faced composite wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal-faced composite wall panel installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, metal-faced composite wall panels, and other manufactured items so as not to be damaged or deformed. Package metal-faced composite wall panels for protection during transportation and handling.
- B. Unload, store, and erect metal-faced composite wall panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Store metal-faced composite wall panels vertically, covered with suitable weathertight and ventilated covering. Store metal-faced composite wall panels to ensure dryness, with positive slope for drainage of water. Do not store metal-faced composite wall panels in contact with other materials that might cause staining, denting, or other surface damage. Do not allow storage space to exceed 120 deg F (49 deg C).
- D. Retain strippable protective covering on metal-faced composite wall panel for period of panel installation.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal-faced composite wall panels to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal-faced composite wall panel fabrication and indicate measurements on Shop Drawings.

1.11 COORDINATION

- A. Coordinate metal-faced composite wall panel assemblies with rain drainage work, flashing, trim, and construction of studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

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1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures, including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS**2.1 PANEL MATERIALS**

- A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finishes:
 - a. Two-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - b. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Four-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish

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containing not less than 70 percent PVDF resin by weight in color coat and clear coats. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- d. Mica Fluoropolymer: AAMA 620. 2-coat fluoropolymer finish with suspended mica flakes containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - e. Metallic Fluoropolymer: AAMA 620. 3-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - f. FEVE Fluoropolymer: AAMA 620. 2-coat fluoropolymer finish containing 100 percent FEVE resin in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Exposed Anodized Finishes:
- a. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm] [AA-M12C22A31, Class II, 0.010 mm] or thicker.
 - b. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 temper.

1. Exposed Finish: Apply the following finish, as specified or indicated on Drawings.
- a. Natural.
 - b. Brushed Satin: CDA M32-06x (Mechanical Finish: directionally textured, medium satin; Coating: clear organic, air drying, as specified below):
 - c. Mirror Polished: CDA M22-06x (Mechanical Finish: buffed, specular; Coating: clear organic, air drying, as specified below):
 - 1) Clear, Organic Coating: Clear, air-drying, acrylic lacquer specially developed for coating copper-alloy products, applied by air spray in 2 coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil (0.025 mm).
 - d. Pre-patinated: ASTM B 882. Copper sheets artificially aged by chemical reaction to convert surface to inorganic crystalline structure with color range and durability of naturally formed patina.

C. Panel Sealants:

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1. Joint Sealant: ASTM C 920; elastomeric polyurethane, polysulfide, or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal-faced composite wall panels and remain weathertight; and as recommended in writing by panel manufacturer.

2.2 MISCELLANEOUS METAL FRAMING

- A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, [ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized] [ASTM A 653/A 653M, G60 (Z180) hot-dip galvanized] or coating with equivalent corrosion resistance unless otherwise indicated.
- B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch (1.63-mm) nominal thickness.
- C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.
- D. Base or Sill Angles and Channels: 0.079-inch (2.01-mm) nominal thickness.
- E. Hat-Shaped, Rigid Furring Channels:
 1. Nominal Thickness: As required to meet performance requirements 0.040 inch (1.02 mm)
 2. Depth: As indicated.
- F. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.
 1. Nominal Thickness: As required to meet performance requirements, 0.064 inch (1.63 mm).
 2. Depth: As Indicated.
 3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch (1.02 mm).
 4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.22-mm-) diameter wire.
- G. Fasteners for Miscellaneous Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten miscellaneous metal framing members to substrates.

2.3 MISCELLANEOUS MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

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2.4 METAL-FACED COMPOSITE WALL PANELS <Insert drawing designation>

- A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.
 - 1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alcan Composites USA Inc.; Alucobond Alucobond Plus.
 - b. Alcoa Inc.; Reynobond PE FR.
 - c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC ALPOLIC/fr ALPOLIC Copper.
 - d. CENTRIA Architectural Systems; Formabond Wall System.
 - e. Citadel Architectural Products, Inc., Envelope 2000 (RS)(RR).
 - f. Copper Sales, Inc.; UNA-FAB Series 1000 Series 1500.
 - g. Protean Construction Products, Inc.; ACM 100.
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, aluminum sheet facings.
 - 1. Panel Thickness: As indicated on Drawings
 - 2. Core: Standard
 - 3. Exterior Finish: Metallic fluoropolymer
 - a. Color: See 096000 Finishes.
- C. Attachment System Components: Formed from material compatible with panel facing.
 - 1. Include manufacturer's standard perimeter extrusions with integral weather stripping, panel stiffeners, panel clips, and anchor channels.

2.5 ACCESSORIES

- A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.
- B. Flashing and Trim: Formed from 0.018-inch- (0.46-mm-) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required

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to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

2.6 FABRICATION

- A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.
- C. Metal-Faced Composite Wall Panels: Factory form panels in a batch process by laminating each sheet using glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.
 - 1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
 - 2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
 - 3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
 - 4. Dimensional Tolerances:
 - a. Panel Bow: 0.8 percent maximum of panel length or width.
 - b. Squareness: 0.25 inch (5 mm) maximum.
- D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
 - 1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
 - 2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
 - 3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
 - 4. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
 - 5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

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6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal-faced composite wall panel manufacturer.
 - a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal-faced composite wall panel manufacturer for application, but not less than thickness of metal being secured.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal-faced composite wall panel supports, and other conditions affecting performance of the Work.
 1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal-faced composite wall panel manufacturer.
 2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal-faced composite wall panel manufacturer.
 3. Verify that weather-resistant sheathing paper has been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal-faced composite wall panels to verify actual locations of penetrations relative to seam locations of panels before panel installation.
- C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

3.3 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

- A. General: Install metal-faced composite wall panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts unless otherwise indicated. Anchor panels and other components of the Work securely in place, with provisions for thermal and structural movement.
1. Commence metal-faced composite wall panel installation and install minimum of 300 sq. ft. (27.8 sq. m) in presence of factory-authorized representative.
 2. Shim or otherwise plumb substrates receiving metal-faced composite wall panels.
 3. Flash and seal metal-faced composite wall panels at perimeter of all openings. Do not begin installation until weather barrier and flashings that will be concealed by panels are installed.
 4. Install flashing and trim as metal-faced composite wall panel work proceeds.
 5. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
 6. Provide weathertight escutcheons for pipe and conduit penetrating exterior walls.
- B. Fasteners:
1. Aluminum Wall Panels: Use aluminum or stainless-steel fasteners for surfaces exposed to the exterior and aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
 2. Copper Wall Panels: Use copper, stainless-steel, or hardware-bronze fasteners.
- C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action as recommended by metal-faced composite wall panel manufacturer.
- D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal-faced composite wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by panel manufacturer.
1. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."
- E. Attachment System Installation, General: Install attachment system

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required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
 2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.
- F. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-turned flanges of wall panels to panel clips with manufacturer's standard fasteners.
1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."
- G. Track-Support Installation: Provide manufacturer's standard horizontal and vertical tracks that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach panels to wall by interlocking tracks with perimeter extrusions attached to wall panels. Fully engage integral gaskets and leave horizontal and vertical joints with open reveal.
1. Attach routed-and-turned flanges of wall panels to perimeter extrusions with manufacturer's standard fasteners.
 2. Attach flush wall panels to perimeter extrusions by engaging panel edges and by attaching with manufacturer's standard structural silicone adhesive.
 3. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 4. Do not apply sealants to joints unless otherwise indicated on Drawings.
- H. Subgirt-and-Spline Installation: Provide manufacturer's standard subgirts and splines that provide support and complete secondary drainage system, draining to the exterior at horizontal joints. Install support system at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by interlocking perimeter extrusions attached to routed-and-turned flanges of wall panels with subgirts and splines. Fully engage integral subgirt-and-spline gaskets and leave horizontal and vertical joints with open reveal.
1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
 2. Do not apply sealants to joints unless otherwise indicated on Drawings.
- I. Rainscreen-Principle Installation: Provide manufacturer's standard pressure-equalized, rainscreen-principle system with vertical channel that provides support and complete secondary drainage system, draining at

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base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach wall panels by engaging horizontal support pins into notches in vertical channels and into flanges of wall panels. Leave horizontal and vertical joints with open reveal.

1. Install wall panels to allow individual panels to "free float" and be installed and removed without disturbing adjacent panels.
2. Do not apply sealants to joints unless otherwise indicated on Drawings.

3.4 ACCESSORY INSTALLATION

- A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.
 1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
 1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

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- B. Water Penetration: Test areas of installed system indicated on Drawings for compliance with system performance requirements according to ASTM E 1105 at minimum differential pressure of 20 percent of inward-acting, wind-load design pressure as defined by SEI/ASCE 7, but not less than 6.24 lbf/sq. ft. (300 Pa).
- C. Water-Spray Test: After completing the installation of 75-foot- (23-m-) by-2-story minimum area of metal-faced composite wall panel assembly, test assembly for water penetration according to AAMA 501.2 in a 2-bay area directed by Architect.
- D. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust completed metal-faced composite wall panel installation, including accessories.
- E. Metal-faced composite wall panels will be considered defective if they do not pass tests and inspections.
- F. Additional tests and inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- G. Prepare test and inspection reports.

3.7 CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.
- B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.
- C. Replace metal-faced composite wall panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

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.

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SECTION 07 52 16.13**STYRENE-BUTADIENE-STYRENE MODIFIED BITUMINOUS MEMBRANE ROOFING, COLD-APPLIED****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies modified bituminous sheet roofing and base flashing installed using cold-applied adhesive on new construction with solar reflective granular coating.
- B. Repairs and alteration work, including temporary roofs.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 13 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Procedures and requirements for managing and disposing construction and demolition waste: Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
- C. Wood cants, blocking and wood edge strips: Section 06 10 00, ROUGH CARPENTRY.
- D. Roof Insulation under Membrane: 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 71 00, ROOF SPECIALTIES.

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):
 - 1. ANSI/SPRI ES-1-03 Wind Design Standards for Edge Systems Used with Low Slope Roofing Systems
- C. American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI):
 - 1. ASCE/SEI-7-10 Minimum Design Loads for Buildings and Other Structures

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- 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):
1. C1370-00(R2005) Standard Test Method for Determining the Chemical Resistance of Aggregates for Use in Chemical-Resistant Sulfur Polymer Cement Concrete and Other Chemical-Resistant Polymer Concretes
 2. C1371-04 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
 3. C1549-04 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
 4. D146-04 Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing
 5. D1644-01(R2006) Standard Test Methods for Nonvolatile Content of Varnishes
 6. D2523-00(R2006) Standard Practice for Testing Load-Strain Properties of Roofing Membranes
 7. D2823-05 Standard Specification for Asphalt Roof Coatings, Asbestos Containing
 8. D3960-05 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
 9. D4073-06 Standard Test Method for Tensile-Tear Strength of Bituminous Roofing Membranes
 10. D4263-83(2005) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
 11. D4586-07 Asphalt Roof Cement, Asbestos Free
 12. D4601-04 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing
 13. D4897-01 Asphalt Coated Glass Fiber Venting Base Sheet Used in Roofing
 14. D5147-07 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material
 15. D5201-05(R2010) Standard Practice for Calculating Formulation Physical Constants of Paints and Coatings
 16. D6162-00(R2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements
 17. D6163-00(2008) Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements
 18. D6164-05 Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements

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19. D6511-06 Standard Test Methods for Solvent Bearing Bituminous Compounds
 20. E108-10 Standard Test Methods for Fire Tests of Roof Coverings
 21. E408-71(R2008) Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
 22. E1918-06 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
 23. E1980-01 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
 24. WK 29032-10 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
- F. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)
1. ASHRAE 90.1-2007 Energy Standard for Buildings Except Low-Rise Residential Buildings, Appendix f.
- G. Cool Roof Rating Council:
1. CRRC-1 Product Rating Program, www.coolroofs.org
- H. FM Approvals: RoofNav Approved Roofing Assemblies and Products.
1. 4450 Approved Standard for Class 1 Insulated Steel Deck Roofs
 2. 4470 Approved Standard for Class 1 Roof Coverings
 3. 1-28 Loss Prevention Data Sheet: Design Wind Loads.
 4. 1-49 Loss Prevention Data Sheet: Perimeter Flashing
- I. National Roofing Contractors Association: Roofing and Waterproofing Manual
- J. U.S. Environmental Protection Agency (EPA):
1. EPA 600/R13/116 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.

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- B. Roofing Membrane System Load-Strain Properties: Provide a roofing membrane identical to component systems that have been successfully tested by a qualified independent testing and inspecting agency to meet the following minimum load-strain properties at membrane failure when tested according to ASTM D2523:
1. Tensile strain at failure, at 0 deg F (-18 deg C): 600 lbf (2.67 kN) cross machine direction, minimum; 4.0 to 5.5 percent elongation at break.
- C. Roofing System Energy Performance Requirements: Provide a roofing system identical to components that that have been successfully tested by a qualified independent testing and inspecting agency to meet the following requirements:
1. Energy Performance, Energy Star: Provide roofing system that is listed on DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.
 2. Solar Reflectance Index: Not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.
 3. Energy Performance, CRRC-1: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.
 4. Energy Performance, Aged: Provide roofing system with minimum three-year aged solar reflectance not less than 0.55 when tested in accordance with ASTM C1549 or ASTM E1918, and in addition, a minimum three-year-aged thermal emittance of 0.75 when tested in accordance with ASTM C1371 or ASTM E408.
 - a. Where tested aged values are not available for proposed product, submit calculations to adjust initial solar reflectance to demonstrate compliance as indicated in ASHRAE 90.1-2007 Addendum f.
 - b. Alternatively, provide roofing system with minimum three-year aged Solar Reflectance Index of not less than 64 when determined in accordance with the Solar Reflectance Index method in ASTM E1980 using a convection coefficient of 2.1 BTU/h-ft² (12 W/m²K).

1.5 QUALITY ASSURANCE

- 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

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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 Qualifications:

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 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.).
3. Bio-Based Materials: Where applicable, provide products designated by USDA and meeting or exceeding USDA recommendations for bio-based content, and products meeting Rapidly Renewable Materials and certified sustainable wood content definitions; refer to www.biopreferred.gov.

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.
4. Roofing System Design: Provide roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.
 - a. Corner Uplift Pressure: <insert> kPa/sq. m (<insert> lbf/sq. ft.).
 - b. Perimeter Uplift Pressure: <insert> kPa/sq. m (<insert> lbf/sq. ft.).
 - c. Field-of-Roof Uplift Pressure: <insert> kPa/sq. m (<insert> lbf/sq. ft.).
5. FM Approvals Listing: Provide roofing membrane, base flashing, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a roofing system and that are listed in FM Approvals "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - a. Fire/Windstorm Classification: Class 1A-[60][75][90][105][120].

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- b. Hail Resistance: MH.
- 6. High Wind Zone Design Requirement: Contractor Option: In lieu of FM Approval Listing windstorm classification, provide roofing membrane, base flashing, and component materials that comply with Miami-Dade County requirements.
- 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 Contracting Officer's Representative.
 - 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. Modified bituminous sheet roofing and flashing membrane.
 - 3. Roofing adhesive.
 - 4. Roof walkway.
 - 5. Fastening requirements.
 - 6. Application instructions.
- C. LEED and Federal Sustainable Design Submittals:
 - 1. Product Test Reports for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
 - 2. Product Data for Credit IEQ 4.1: For adhesives and sealants used inside the weatherproofing system, documentation including printed statement of VOC content.
 - 3. Product Data for Federally-Mandated Bio-Based Materials: For roof materials, indicating USDA designation and compliance with

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definitions for bio-based products, Rapidly Renewable Materials, and certified sustainable wood content.

D. Samples:

1. Nails and fasteners, each type.

E. Shop Drawings: Include plans, sections, details, and attachments.

1. Base flashings and terminations.
2. Nailers and cants.

F. Certificates:

1. Indicating materials and method of application of roofing system meets requirements of FM Approvals "RoofNav" for specified fire/windstorm classification.
2. Indicating compliance with Miami-Dade County requirements.
3. Indicating compliance with load/strain properties requirement.
4. Indicating compliance with energy performance requirement.

G. Warranty: As specified.

H. Documentation of supervisors' and inspectors' qualifications.

I. Field reports of roofing inspector.

J. Temporary protection plan. Include list of proposed temporary materials.

K. 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.

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1.9 WARRANTY

- A. Roofing work subject to the terms of the Article "Warranty of Construction", FAR clause 52.246-21, except extend warranty period to [10]<____> years from acceptance of facility by the Government

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.
 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Multipurpose Construction Adhesives: 70 g/L.
 - b. Contact Adhesives: 80 g/L.
 - c. Other Adhesives: 250 g/L.
 - d. Nonmembrane Roof Sealants: 300 g/L.
 - e. Sealant Primers for Nonporous Substrates: 250 g/L.
 - f. Sealant Primers for Porous Substrates: 775 g/L.
- 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. Non-Volatile Content, minimum, ASTM D2823: 30 percent.
 3. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 65 g/L.
- C. Cold-Applied Adhesive for sheet membrane: One-part, asbestos-free, low-volatile, 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 D6511: Less than 250 g/L.
 3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
 4. Uniformity and Consistency, ASTM D6511: Pass.
- 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.

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2. Volatile Organic Compounds (VOC), maximum, ASTM D6511: Less than 250 g/L.
 3. Nonvolatile Content, minimum, ASTM D6511: 75 percent.
 4. Uniformity and Consistency, ASTM D6511: 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 D4897, Type II, venting, nonperforated, heavyweight, asphalt-impregnated and coated, glass-fiber base sheet with coarse granular surfacing or embossed venting channels on bottom surface.
- C. Membrane Ply Sheet: ASTM D6163, Grade S, Type II or III, glass-fiber-reinforced, SBS/SEBS-modified asphalt sheet, or ASTM D6162, Grade S, Type II or III, SBS/SEBS-modified asphalt sheet; smooth surfaced; suitable for application method specified, with the following minimum properties:
1. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 21 kN/m (120 lbf/in).
 2. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 890 N (200 lbf).
 3. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, at 5 percent maximum load ASTM D5147: 40 percent.
- D. Membrane Cap Sheet: ASTM D6163, Grade G, Type II, glass-fiber-reinforced, SBS-modified asphalt sheet; granular surfaced with a factory applied, white, reflective, acrylic coating; CRRC listed and California Title 24 Energy Code compliant; and as follows:
1. Exterior Fire-Test Exposure, ASTM E108: Class A.
 2. Tensile Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 12.2 kN/m (70 lbf/in).
 3. Tear Strength at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 440 N (100 lbf).
 4. Elongation at 23 deg. C (73 deg. F), minimum, cross machine direction, ASTM D5147: 7.5 percent.
 5. Low Temperature Flex, maximum, ASTM D5147, -26 deg. C (-15 deg. F).
 6. Reflectance, ASTM C1549: 71 percent.
 7. Thermal Emittance, ASTM C1371: 0.87.
 8. Solar Reflectance Index (SRI), ASTM E1980: 87.
- E. Base Flashing Backer Sheet: ASTM D4601, Type II, asphalt-impregnated and coated, glass-fiber sheet, dusted with fine mineral surfacing on both sides.

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- F. Base Flashing Sheet: ASTM D6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; Granule Color: White.
- G. Gravel Overburden: Provide protection board as required by roofing manufacturer. Install gravel finish coat to match color and size of existing gravel at roof over entry to hospital building.

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.

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:

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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 bitumen.
- 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 Contracting Officer's Representative, for roof areas that are to remain intact, and

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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, 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.

3.5 INSTALLATION OF MODIFIED BITUMEN MEMBRANE

- A. Primer: Apply primer to substrates where recommended by roofing manufacturer, in application quantities recommended by roofing manufacturer.
- B. Cold-Applied Adhesive: Apply cold-applied adhesive in application quantities recommended by roofing manufacturer at substrate, between membrane sheets, and as glaze coat where required.
- C. Membrane Sheets:
 - 1. Number of Plies: 2, minimum, including base sheet and cap sheet, and additional plies as required to meet load/strain properties specified

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in Part 1 of this Section.

2. Commence the laying of sheets at the low points.
3. Roll sheets into cold-applied adhesive 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 Top Sheet and Base Sheet:
 - a. Base sheet, lapped 75 mm (three inches).
 - b. Use 450 mm (18 inch) starting widths, lap top sheet 475 mm (19 inches).
 - c. Lap end joints of sheet 150 mm (six inches). Stagger end joints in relation to end joints in adjacent and proceeding plies.

D. Roofing on Nailable Decks:

1. On insulating concrete, install one ply of venting base sheet with mineral aggregate surface down, nailed to deck with lap as specified and seal lap edges with roof cement. Terminate venting base sheet as follows:
 - a. At vertical surfaces: Extend venting base sheet up vertical surface over cants to top of base flashing or curb.
 - b. At roof edge under gravel stops install venting base sheet over blocking: Extend base sheet not less than two inches beyond outer edge and turn down so that venting can be accomplished.
 - c. At roof edge over fascia-cant: Extend base sheet over top of cant and turn down over outer face of cant to permit venting at the edge.
2. On poured gypsum, precast gypsum plank, cement-wood fiber plank, wood plank, or plywood decks install one layer of building paper followed by base sheet.
 - a. Apply building paper lapping ends and edges 50 mm (two inches) Lay smoothly without buckles or wrinkles. Staple or nail sufficiently to hold in place until roof membrane is installed.
 - b. One ply of venting base sheet. Lay base sheet down dry on deck, Nail as specified. Lap as specified and seal lap edges with roof cement.

E. 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 cold-applied adhesive before gravel stops or other metal flanges extending out onto the membrane are installed.

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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.

3.6 BASE FLASHING

- A. Provide built-up base flashing over cants and as necessary to make work watertight.
- B. Prime vertical surfaces of masonry and concrete with asphalt primer except where vented base sheet is required to provide edge venting.
- C. Apply flashing on top of roofing, up face of cant and up the face of the vertical surface, at least 200 mm (eight inches) above the roofing but not more than 350 mm (14 inches) above the roofing, generally full height beneath counter flashing or top of curb flashing.
 1. At fascia-cants, extend to top of cant and cut off at top of cant.
 2. At reglet, extend full depth into the reglet.
 3. Where venting base sheet is used with insulating concrete, do not seal edges of venting base sheet with bitumen; allow for venting.
- D. Use two plies of modified bituminous sheet.
 1. Extend the first ply 100 mm (four inches) out on the roofing, and the second ply 75 mm (three inches) beyond the first ply. Lap ends 75 mm (three inches) with joints broken 450 mm (18 inches) in each ply. Use smooth surface modified bituminous sheet for first ply.
 2. Use granular surfaced modified bitumen cap sheet.
- E. Set base flashing in a solid application of cold-applied adhesive.
 1. Set cap sheet in cold-applied adhesive with laps sealed with cold-applied adhesive.
 2. Except for venting roof edges, seal the top edge of the base flashing with roof cement.
- F. Except at metal fascia cants, secure top edge of base flashing with nails on a line approximately 25 mm (one inch) below top edge, spaced not more than 200 mm (eight inches) on center.
 1. Cover nail heads with roof cement.
 2. Cover the top of the base flashing with counterflashing as specified in Section 07 60 00, FLASHING AND SHEET METAL. At the fascia cants secure the top edge of the flashing with fascia compression clamp as specified in Section 07 60 00, FLASHING AND SHEET METAL.

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3.7 STRIPPING

- A. Coordinate to set flanges of metal flashing in roof cement on top sheet of the modified bituminous roofing and mailing to blocking with Section 07 60 00, FLASHING AND SHEET METAL.
- B. Cover that portion of the horizontal flanges of metal base flashings, gravel stops, and other flanges extending out onto the roofing with modified bituminous sheet.
- C. Extend the sheet out on the roofing 150 mm six inches beyond the edge of the metal flange. Cut edge to fit tight against vertical members of flange.
- D. Prime flange before stripping, embed sheet in cold-applied adhesive.

3.8 ROOF WALKWAYS

- A. Install roof walkways where indicated.
- B. Set prefabricated planks in solid application of cold-applied adhesive. Maintain 75 mm (three inch) to 150 mm (six-inch) space between planks.

3.9 APPLICATION OF COATING

- A. Apply coating on cap sheet when required to meet solar reflectance performance requirements.
- B. Apply coating to membrane and base flashings according to manufacturer's written instructions by spray or roller.
- C. Provide dry film thickness of minimum 20 mils (0.5 mm).

3.10 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. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of [5][7][10] full-time days on site to perform roof tests and inspections and to prepare start up, interim, and final reports. Roofing Inspector's quality assurance inspections shall comply with criteria established in ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
- C. 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

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performed to determine if replaced or additional work complies with specified requirements.

3.11 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.

3.12 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 60 00**FLASHING AND SHEET METAL****PART 1 - GENERAL****1.1 DESCRIPTION**

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

1.2 RELATED WORK

- A. 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. Manufactured flashing, copings, roof edge metal, and fasciae: Section 07 71 00 ROOF SPECIALTIES.
- D. Membrane base flashings and stripping: Section 07 52 16.13, SBS MEMBRANE ROOFING.
- E. Flashing components of factory finished roofing and wall systems: Division 07 roofing and wall system sections.
- F. Joint Sealants: Section 07 92 00, JOINT SEALANTS.
- G. Color of factory coated exterior architectural metal and anodized aluminum: Section 09 06 00, SCHEDULE FOR FINISHES.
- H. 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.
- I. Paint materials and application: Section 09 91 00, PAINTING.
- J. Flashing of Roof Drains: Section 22 14 00, FACILITY STORM DRAINAGE.

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

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- 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 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

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2. Federal Specification (Fed. Spec):
3. A-A-1925A Shield, Expansion; (Nail Anchors)
4. UU-B-790A Building Paper, Vegetable Fiber

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 instal **copings, roof-edge flashings**, etc. as shown, tested per ANSI/SPRI ES-1 to resist design pressure <insert **design pressure**>[**indicated on Drawings**].

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: For all specified items, including:
1. Flashings
 2. Copings
 3. 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 Sheeting: Elastomeric substances reduced to thermoplastic state and extruded into continuous homogenous sheet (0.056 inch) thick. Sheeting shall have not less than 7 MPa (1,000 psi) tensile strength and not more than seven percent tension-set at 50 percent elongation when tested in accordance with ASTM D412. Sheeting shall show no cracking or flaking when bent through 180 degrees over a 1 mm (1/32 inch) diameter mandrel and then bent at same point over same size mandrel in opposite direction through 360 degrees at temperature of -30 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. Eposed 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.
 - 5. Fabricate slip-type or loose locked joints and fill with sealant

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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 by folding edge of flashing back on itself when not hooked to edge

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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 edge turned up 6 mm (1/4 inch) and exposed edge designed to receive

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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 mm (4 inches) on center unless specified otherwise.

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8. Install bolts, rivets, and screws where indicated, specified, or required in accordance with the SMACNA Sheet Metal Manual. Space rivets at 75 mm (3 inch) on centers in two rows in a staggered position. Use neoprene washers under fastener heads when fastener head is exposed.
9. Coordinate with roofing work for the installation of metal base flashings and other metal items having roof flanges for anchorage and watertight installation.
10. Nail continuous cleats on 75 mm (3 inch) on centers in two rows in a staggered position.
11. Nail individual cleats with two nails and bend end tab over nail heads. Lock other end of cleat into hemmed edge.
12. Install flashings in conjunction with other trades so that flashings are inserted in other materials and joined together to provide a water tight installation.
13. Where required to prevent galvanic action between dissimilar metal isolate the contact areas of dissimilar metal with sheet lead, waterproof building paper, or a coat of bituminous paint.
14. Isolate aluminum in contact with dissimilar metals others than stainless steel, white bronze or other metal compatible with aluminum by:
 - a. Paint dissimilar metal with a prime coat of zinc-chromate or other suitable primer, followed by two coats of aluminum paint.
 - b. Paint dissimilar metal with a coat of bituminous paint.
 - c. Apply an approved caulking material between aluminum and dissimilar metal.
15. Paint aluminum in contact with or built into mortar, concrete, plaster, or other masonry materials with a coat of bituminous paint.
16. Paint aluminum in contact with absorptive materials that may become repeatedly wet with two coats of bituminous paint or two coats of aluminum paint.
17. Bitumen Stops:
 - a. Install bitumen stops for built-up roof opening penetrations through deck and at formed sheet metal gravel stops.
 - b. Nail leg of bitumen stop at 300 mm (12 inch) intervals to nailing strip at roof edge before roofing material is installed.

3.2 THROUGH-WALL FLASHING

A. General:

1. Install continuous through-wall flashing between top of concrete foundation walls and bottom of masonry building walls; at top of concrete floors; under masonry, concrete, or stone copings and elsewhere as shown.
2. Where exposed portions are used as a counterflashings, lap base flashings at least 100 mm (4 inches) and use thickness of metal as specified for exposed locations.

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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. Lintel Flashing when not part of shelf angle flashing:

1. Install flashing full length of lintel to nearest vertical joint in masonry over veneer.
2. Turn ends up 25 mm (one inch) and fold corners to form dam and extend end to face of wall.
3. Turn back edge up to top of lintel; terminate back edge as specified for back-up wall.

G. Window Sill Flashing:

1. Install flashing to extend not less than 100 mm (4 inch) beyond ends of sill into vertical joint of masonry or veneer.
2. Turn back edge up to terminate under window frame.
3. Turn ends up 25 mm (one inch) and fold corners to form dam and extend to face of wall.

H. 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

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mm (8 feet) nor more than 3000 mm (ten feet). Install a 75 mm (3 inch) wide slip type, loose lock expansion joint filled with sealant in joints of base flashing sections over 2400 mm (8 feet) in length. Lock and solder corner joints at corners.

- C. Extend base flashing up under counter flashing of roof specialties and accessories or equipment not less than 75 mm (3 inch).

3.4 COUNTERFLASHING (CAP FLASHING OR HOODS)

A. General:

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

B. 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,

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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) 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.

- - - E N D - - -

SECTION 07 71 00**ROOF SPECIALTIES****PART 1 - GENERAL****1.1 DESCRIPTION**

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

1.2 RELATED WORK

- A. Sustainable design requirements 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 and texture of finish: Section 09 06 00, SCHEDULE FOR FINISHES. Sealant material and installation: Section 07 92 00, JOINT SEALANTS.
- D. General insulation: Section 07 21 13, THERMAL INSULATION. Rigid insulations for roofing: Section 07 22 00, ROOF AND DECK INSULATION

1.3 QUALITY 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.

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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. 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 ROOF HATCH (SCUTTLE)

- A. Fabricate from aluminum with mill finish.
- B. Curb and Cover:
 - 1. Exterior facing: Minimum 2.3 mm (0.09 inch) thick sheet aluminum.
 - 2. Interior facing: Minimum 1 mm (0.04 inch) thick sheet aluminum.
 - 3. Minimum of 25 mm (one inch) thick mineral fiber insulation between facings of cover and over exterior face of curb.
 - 4. Form exterior curb facing with an integral three inch wide roof flange

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and cap flashing minimum 2.3 mm (0.09 inch) thick sheet aluminum.

5. Make curb [300 mm (12 inches)] <____>.
6. Form cover to lap curb and cap flashing.
7. Size opening as shown.

C. Hardware:

1. Provide spring snap latch with inside and outside operating handles and padlock hasp on inside. Provide two snap latches when hinge side is over 2100 mm (7 feet) long.
2. Provide pintle hinges.
3. Provide automatic hold open and operating arm with enclosed torsion or compression spring lifting mechanism.
4. Covers shall automatically lock in the open position at not less than 70 degrees.
5. Provide weatherstripping at cover closure.
6. Galvanize all hardware items.

D. Assembly:

1. Completely shop assemble roof scuttle.
2. Fully weld all joints exposed to the weather and built into the roofing.
3. Finish weld smooth where exposed.
4. Operation with minimum force to open and close.

2.3 EQUIPMENT SUPPORTS

- A. Form exterior curb with integral base and deck closures for curbs installed on steel decking.

2.4 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.

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.

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- 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 manufacturers recommendations.

3.2 PROTECTION OF ALUMINUM

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

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.

- - - E N D - - -

SECTION 07 81 00**APPLIED FIREPROOFING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies mineral fiber and cementitious coverings to provide fire resistance to interior structural steel members shown.

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.

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. Manufacturer's complete and detailed application instructions and specifications.
 - 2. Manufacturer's repair and patching instructions.
- C. Certificates:
 - 1. Certificate from testing laboratory attesting fireproofing material and application method meet the specified fire ratings.
 - a. List thickness and density of material required to meet fire ratings.
 - b. Accompanied by complete test report and test record.
 - 2. Manufacturer's certificate indicating sprayed-on fireproofing material supplied under the Contract is same within manufacturing tolerance as fireproofing material tested.
- D. Miscellaneous:
 - 1. Manufacturer's written approval of surfaces to receive sprayed-on fireproofing.
 - 2. Manufacturer's written approval of completed installation.
 - 3. Manufacturer's written approval of the applicators of fireproofing material.

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1.4 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver to jobsite in sealed containers marked and labeled to show manufacturer's name and brand and certification of compliance with the specified requirements.
- B. Remove damaged containers from the site.
- C. Store the materials off the ground, under cover, away from damp surfaces.
- D. Keep dry until ready for use.
- E. Remove materials that have been exposed to water before installation from the site.

1.5 QUALITY CONTROL

- A. Test for fire endurance in accordance with ASTM E119, for fire rating specified, in a nationally recognized laboratory.
- B. Manufacturer's inspection and approval of surfaces to receive fireproofing as specified under paragraph Examination.
- C. Manufacturer's approval of fireproofing applications.
- D. Manufacturer's approval of completed installation.
- E. Manufacturer's representative shall observe and advise at the commencement of application, and shall visit the site as required thereafter for the purpose of ascertaining proper application.
- F. Pre-Application Test Area.
 - 1. Apply a test area consisting of a typical overhead fireproofing installation, including not less than 4.5 m (15 feet) of beam and deck.
 - a. Apply to one column.
 - b. Apply for the hourly ratings used.
 - 2. Install in location selected by the Contracting Officer's Representative, for approval by the representative of the fireproofing material manufacturer and by the Government.
 - 3. Perform Bond test on painted steel in accordance with ASTM E736.
 - 4. Do not proceed in other areas until installation of test area has been completed and approved.
 - 5. Keep approved installation area open for observation as criteria for sprayed-on fireproofing.

1.6 APPLICABLE PUBLICATIONS

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

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

1. C841-03 Installation of Interior Lathing and Furring
2. C847-06 Metal Lath
3. E84-08 Surface Burning Characteristics of Building Materials
4. E119-08 Fire Tests of Building Construction and Materials
5. E605-93 (R2006) Thickness and Density of Sprayed Fire-Resistive Materials Applied to Structural Members
6. E736-00 Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
7. E759-92 (R2005) The Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members
8. E760-92 (R2005) Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members
9. E761-92 (R2005) Compressive Strength of Fire-Resistive Material Applied to Structural Members
10. E859-93 (R2006) Air Erosion of Sprayed Fire-Resistive Materials Applied to Structural Members
11. E937-93 (R2005) Corrosion of Steel by Sprayed Fire-Resistive Material Applied to Structural Members
12. E1042-02 Acoustically, Absorptive Materials Applied by Trowel or Spray.
13. G21-96 (R2002) Determining Resistance of Synthetic Polymeric Materials to Fungi

C. Underwriters Laboratories, Inc. (UL):

1. Fire Resistance Directory Latest Edition including Supplements

D. Warnock Hersey (WH):

1. Certification Listings Latest Edition

E. Factory Mutual System (FM):

1. Approval Guide Latest Edition including Supplements

PART 2 - PRODUCTS**2.1 SPRAYED-ON FIREPROOFING**

A. ASTM E1042, Class (a), Category A.

1. Type I, factory mixed cementitious materials with approved aggregate.

B. Materials containing asbestos are not permitted.

C. Fireproofing characteristics when applied in the thickness and density

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required to achieve the fire-rating specified.

	Characteristic	Test	Results
1.	Deflection	ASTM E759	No cracking, spalling, or delamination when backing to which it is applied has a deflection up to 1/120 in 3 m (10 ft.)
2.	Corrosion-Resistance	ASTM E937	No promotion of corrosion of steel.
3.	Bond Impact	ASTM E760	No cracking, spalling, or delamination.
4.	Cohesion/Adhesion (Bond Strength)	ASTM E736	Minimum cohesive/adhesive strength of 9.57 kPa (200 lbf/ft ²) for protected areas. 19.15 kPa (400 lbf/ft ²) for exposed areas.
5.	Air Erosion	ASTM E859	Maximum gain weight of the collecting filter 0.27gm/m ² (0.025 gm/ft ²).
6.	Compressive Strength	ASTM E761	Minimum compressive strength 36 kPa (5 lbf/in ²).
7.	Surface Burning Characteristics with adhesive and sealer to be used	ASTM E84	Flame spread 25 or less smoke developed 50 or less
8.	Fungi Resistance	ASTM G21	Resistance to mold growth when inoculated with aspergillus niger (28 days for general application)

D. Density:

1. Standard density: Not less than 240 kg/m³ (15 lb/cu. ft.)

2.2 SUBSTRATE PRIMERS

A. Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:

1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to Contracting Officer's Representative, based on a series of bond tests according to ASTM E736.

2.3 BONDING AGENT

A. Bonding agent approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable Contracting Officer's

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Representative.

2.4 SEALER

- A. Sealer as recommended in writing by fireproofing material manufacturer for each fire-resistance design; transparent-drying, water-dispersible, tinted protective coating.
- B. Surface burning characteristics as specified for fireproofing material.
- C. Fungus resistant.
- D. Sealer may be an integral part of the material or applied separately to the exposed surface. When applied separately use contrasting color pigmented sealer, white preferred.

2.5 WATER

- A. Clean, fresh, and free from organic and mineral impurities.
- B. pH of 6.9 to 7.1.

2.6 MECHANICAL BOND MATERIAL

- A. Expanded Metal Lath: ASTM C847, minimum weight of 0.92 kg/m² (1.7 pounds per square yard).
- B. Fasteners: ASTM C841.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Verify surfaces to receive fireproofing are clean and free of dust, soot, oil, grease, water soluble materials or any foreign substance which would prevent adhesion of the fireproofing material.
- B. Verify hangers, inserts and clips are installed before the application of fireproofing material.
- C. Verify ductwork, piping, and other obstructing material and equipment is not installed that will interfere with fireproofing installation.
- D. Verify concrete work on steel decking and concrete encased steel is completed.
- E. Verify temperature and enclosure conditions are required by fireproofing material manufacturer.

3.2 APPLICATION

- A. Do not start application until written approval has been obtained from manufacturer of fireproofing materials that surfaces have been inspected

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by the manufacturer or his representative, and are suitable to receive sprayed-on fireproofing.

- B. Coordinate application of fireproofing material with other trades.
- C. Application of Metal Lath:
 - 1. Apply to beam and columns having painted surfaces which fail ASTM E736 Bond Test requirements in pre-application test area.
 - 2. Apply to beam flanges 300 mm (12 inches) or more in width.
 - 3. Apply to column flanges 400 mm (16 inches) or more in width.
 - 4. Apply to beam or column web 400 mm (16 inches) or more in depth.
 - 5. Tack weld or mechanically fasten on maximum of 300 mm (12 inch) center.
 - 6. See design criteria section of the approved assemblies used.
 - 7. Lap and tie lath member in accordance with ASTM C841.
- D. Mix and apply in accordance with manufacturer's instructions.
 - 1. Mechanically control material and water ratios.
 - 2. Apply adhesive and sealer, when not an integral part of the materials, in accordance with the manufacturer's instructions.
 - 3. Apply to density and thickness indicated in UL Fire Resistance Directory, FM Approval Guide, or WH Certification Listings unless specified otherwise. Test in accordance with ASTM E119.
 - 4. Minimum applied dry density per cubic meter (cubic foot) for the underside of the walk on deck (interstitial) hung purl in or beam and steel deck, columns in interstitial spaces and mechanical equipment rooms shall be as follows:
 - a. Type I - 240 kg/m³ (15 lb/ft³).
- E. Application shall be completed in one area, inspected and approved by Contracting Officer's Representative before removal of application equipment and proceeding with further work.

3.3 FIELD TESTS

- A. Tests of applied material will be performed by VA retained Testing Laboratory. See Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Contracting Officer's Representative will select area to be tested in specific bays on each floor using a geometric grid pattern.
- C. Test for thickness and density in accordance with ASTM E605. Areas showing thickness less than that required as a result of fire endurance test will be rejected.
- D. Areas showing less than required fireproofing characteristics will be rejected on the following field tests.
 - 1. Test for cohesion/adhesion: ASTM E736.

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2. Test for bond impact strength: ASTM E760.

3.4 PATCHING AND REPAIRING

- A. Inspect after mechanical, electrical and other trades have completed work in contact with fireproofing material, but before sprayed material is covered by subsequent construction.
- B. Perform corrective measures in accordance with fireproofing material Manufacturer's recommendations.
 1. Respray areas requiring additional fireproofing material to provide the required thickness, and replace dislodged or removed material.
 2. Spray material for patching by machine directly on point to be patched, or into a container and then hand apply.
 3. Hand mixing of material is not permitted.
- C. Repair:
 1. Respray all test and rejected areas.
 2. Patch fireproofing material which is removed or disturbed after approval.
- D. Perform final inspection of sprayed areas after patching and repair.
- E. Patch areas as required after out-of-sequence penetrations for utility/other support.

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.

3.6 SCHEDULE

- A. Apply fireproofing material in interior structural steel members and on underside of steel roof decks, except on following surfaces:
 1. Steel to be encased in concrete or designated to receive other type of fireproofing.
- B. Type I:
 1. One hour fire rating - not used.
 2. Two hour fire rating - secondary structure and roof deck
 3. Three hour fire rating - primary structure.

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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. 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. Expansion and seismic joint firestopping: Section 07 95 13, EXPANSION JOINT COVER ASSEMBLIES.
- D. Spray applied fireproofing: Section 07 81 00, APPLIED FIREPROOFING
- E. Sealants and application: Section 07 92 00, JOINT SEALANTS.
- F. 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. Manufacturers 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.

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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.

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

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the fire barrier.

- D. Firestop sealants used for firestopping or smoke sealing shall have following properties:
 - 1. Contain no flammable or toxic solvents.
 - 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.

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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.

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. 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. Sealing of site work concrete paving: Section 32 13 20, SITE CONCRETE.
- D. Firestopping penetrations: Section 07 84 00, FIRESTOPPING.
- E. Glazing: Section 08 80 00, GLAZING.
- F. Glazed aluminum curtain wall: Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
- G. Storefront: Section 084113, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- H. Sound rated gypsum partitions/sound sealants: Section 09 29 00, GYPSUM BOARD.
- I. 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

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- qualified according to ASTM C1021.
2. Test elastomeric joint sealants for compliance with requirements specified by reference to ASTM C920, and where applicable, to other standard test methods.
 3. Test elastomeric joint sealants according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C920 for adhesion and cohesion under cyclic movement, adhesion-in peel, and indentation hardness.
 4. Test other joint sealants for compliance with requirements indicated by referencing standard specifications and test methods.
- D. 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

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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 (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

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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):
 - 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:

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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.
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, acetoxycure.

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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.
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

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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.
- 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.

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PART 3 - EXECUTION**3.1 INSPECTION:**

- A. Inspect substrate surface for bond breaker contamination and unsound materials at adherent faces of sealant.
- B. Coordinate for repair and resolution of unsound substrate materials.
- C. Inspect for uniform joint widths and that dimensions are within tolerance established by sealant manufacturer.

3.2 PREPARATIONS:

- A. Prepare joints in accordance with manufacturer's instructions and SWRI.
- 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.

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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.

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.

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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 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.

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- D. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
- E. Repair sealants pulled from test area by applying new sealants following same procedures used to originally seal joints. Ensure that original sealant surfaces are clean and new sealant contacts original sealant.
- F. Evaluation of Field-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements, will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.7 CLEANING:

- A. Fresh compound accidentally smeared on adjoining surfaces: Scrape off immediately and rub clean with a solvent as recommended by 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

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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:

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.

- - - E N D - - -

SECTION 07 95 13**EXPANSION JOINT COVER ASSEMBLIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section specifies floor, wall and ceiling seismic and building expansion joint assemblies.
- B. Types of assemblies:
 - 1. Metal Plate Cover
 - 2. Elastomeric Joint Covers
 - 3. Preformed Elastomeric Sealant Joint

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. Sheet Metal Expansion Joint Seals: Section 07 60 00, FLASHING AND SHEET METAL.
- D. Roof Expansion Joint Cover Assemblies: Section 07 72 00, ROOF ACCESORIES.
- E. Color of Elastomer Inserts, Filler Strips, Exterior Wall Seals and Metal Finishes: Section 09 06 00, SCHEDULE FOR FINISHES
- F. Steel Plate Expansion Joint Covers: Section 05 50 00, METAL FABRICATIONS.

1.3 QUALITY ASSURANCE

- A. Project Conditions:
 - 1. Check actual locations of walls and other construction, to which work must fit, by accurate field measurements before fabrication.
 - 2. Show recorded measurements on final shop drawings.
- B. Fire tests performed by Factory Mutual, Underwriters Laboratories, Inc., Warnock Hersey or other approved independent testing laboratory.

1.4 DELIVERY STORAGE AND HANDLING

- A. Take care in handling of materials so as not to injure finished surface and components.

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- B. Store materials under cover in a dry and clean location off the ground.
- C. Remove materials which are damaged or otherwise not suitable for installation from job site and replace with acceptable materials.

1.5 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Submit copies of manufacturer's current literature and data for each item specified.
 - 2. Clearly indicate movement capability of cover assemblies and suitability of material used in exterior seals for ultraviolet exposure.
- C. Certificates: Material test reports from approved independent testing laboratory indicating and interpreting test results relative to compliance of fire-rated expansion joint assemblies with requirements specified.
- D. Shop Drawings:
 - 1. Showing full extent of expansion joint cover assemblies; include large-scale details indicating profiles of each type of expansion joint cover assembly, splice joints between sections, joiners with other type assemblies, special end conditions, anchorages, fasteners, and relationship to adjoining work and finishes.
 - 2. Include description of materials and finishes and installation instructions.
- E. Samples:
 - 1. Samples of each type and color of metal finish on metal of same thickness and alloy used in work.
 - 2. Samples of each type and color of flexible seal used in work.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed form part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. A36/A36M-08 Structural Steel
 - 2. A167-99(R2009) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
 - 3. A283/A283M-07 Low and Intermediate Tensile Strength Carbon Steel Plates
 - 4. A786/A786M-05(R2009) Rolled Steel Floor Plates
 - 5. B36/B36M-08 Brass, Plate, Sheet, Strip, and Rolled Bar

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6. B121-01(R2006) Leaded Brass Plate, Sheet, Strip and Rolled Bar
 7. B209M-07 Aluminum and Aluminum-Alloy Sheet and Plate
 (Metric)
 8. B221M-08 Aluminum and Aluminum-Alloy Extruded Bars, Rods,
 Wire, Shapes, and Tubes (Metric)
 9. B455-10 Copper-Zinc Lead Alloy (Leaded Brass) Extruded
 Shapes
 10. C864-05 Dense Elastomeric Compression Seal Gaskets,
 Setting Blocks, and Spacers
 11. C920-11 Elastomeric Joint Sealants
 12. D1187-97 (R2002) Asphalt Base Emulsions for Use as Protective
 Coatings for Metal
 13. D2287-96 (R2010) Non-rigid Vinyl Chloride Polymer and Copolymer
 Molding and Extrusion Compounds
 14. E119-10 Fire Tests of Building Construction and Materials
 15. E814-11 Fire Tests of Through-Penetration Fire Stops
- C. Federal Specifications (Fed. Spec):
1. TT-P-645B Primer, Paint, Zinc-Molybdate, Alkyd Type
- D. The National Association of Architectural Metal Manufacturers (NAAMM):
1. AMP 500 Series Metal Finishes Manual.
- E. National Fire Protection Association (NFPA):
1. 251-06 Tests of Fire Endurance of Building Construction and
 Materials
- F. Underwriters Laboratories Inc. (UL):
1. 263-11 Fire Tests of Building Construction and Materials

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Aluminum:
1. Extruded: ASTM B221, alloy 6063-T5.
 2. Plate and Sheet: ASTM B209, alloy 6061-T6.
- B. Elastomeric Sealant:
1. ASTM C920, polyurethane.
 2. Type.
 3. Class 25.
 4. Grade P or NS.

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5. Shore A hardness 25, unless specified otherwise.

C. Thermoplastic Rubber:

1. ASTM C864.
2. Dense Neoprene or other material standard with expansion joint manufacturers having the same physical properties.

D. Vinyl Invertor Sealant Waterstops: Manufacturers' standard shapes and grade.

E. Fire Barrier:

1. Designed for indicated or required dynamic structural movement without material degradation or fatigue.
2. Tested in maximum joint width condition as a component of an expansion joint cover assembly in accordance with UL 263 NFPA 251, or ASTM E119 and E814, including hose steam test at full-rated period.

F. Accessories:

1. Manufacturer's standard anchors, fasteners, set screws, spaces, flexible secondary water stops or seals and filler materials, drain tubes, adhesive and other accessories as indicated or required for complete installations.
2. Compatible with materials in contact.
3. Water stops.

2.2 FABRICATION

A. General:

1. Use ceiling and wall expansion joint cover assemblies of same design as floor to wall and floor to floor expansion joint cover assemblies. Unless shown otherwise.
2. Provide expansion joint cover assemblies of design, basic profile, materials and operation indicated required to accommodate joint size variations in adjacent surfaces, and as required for anticipated structural movement.
3. Deliver to job site ready for use and fabricated in as large sections and assemblies as practical. Assemblies identical to submitted and reviewed shop drawings, samples and certificates.
4. Furnish units in longest practicable lengths to minimize number of end joints. Provide mitered corners where joint changes directions or abuts other materials.
5. Include closure materials and transition pieces, tee-joints, corners, curbs, cross- connections and other assemblies.
6. Fire Performance Characteristics:
 - a. Provide expansion joint cover assemblies identical to those of assemblies whose fire resistance has been determined per ASTM E119 and E814, NFPA 251, or UL 263 including hose stream test at full-rated period.

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- b. Fire rating: Not less than rating of adjacent floor or wall construction.
- 7. Fire Barrier Systems:
 - a. Material to carry label of approved independent testing laboratory, and be subject to follow-up system for quality assurance.
 - b. Include thermal insulation where necessary, in accordance with above tests, with factory cut miters and transitions.
 - c. For joint widths up to and including 150 mm (6 inches), supply barrier in lengths up to 15000 mm (50 feet) to eliminate field splicing.
 - d. For joint widths of seven inches and wider, supply barrier 3000 mm (10 foot) modules with overlapping ends for field splicing.
 - e. For joints within enclosed spaces such as chase walls, include 1 mm (0.032 inch) thick galvanized steel cover where conventional expansion joint cover is not used.
- 8. Seal Strip factory - formed and bonded to metal frames and anchor members.
- 9. Compression Seals: Prefabricate from thermoplastic rubber or dense neoprene to sizes and approximate profiles shown.
- B. Floor-to-Floor Metal Plate Joints:
 - 1. Frames on each side of joint designed to support cover plate of design shown.
 - a. Continuous frame designed to finish flush with adjacent floor of profile indicated with seating surface and raised floor rim to accommodate flooring.
 - b. Provide concealed bolt and steel anchors for embedment in concrete.
 - c. Designed for filler materials between raised rim of frame and edge of cover plate where shown.
 - d. Frame and cover plates of some metal where exposed.
 - 1) Design cover plates to support 180 Kg (400 lbs) per 0.3 square meters (1 square foot).
 - 2) Cover plates free of rattle due to traffic.
 - 3) No gaps or budes occur on filler material during design movement of joint.
 - 4) Provide manufacturer's continuous standard flexible vinyl water stop under floor joint cover assemblies.
- C. Interior Wall Joint Cover Assemblies:
 - 1. Surface Mounted Metal Cover Plates:
 - a. Concealed frame for fastening to wall on one sides of joint.
 - b. Extend cover to lap each side of joint and to permit free movement on one side.
 - c. Provide concealed attachment of cover t frame cover in close contact with adjacent finish wall surfaces.
 - d. Use angle cover plates at intersection of walls.

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- e. Use smooth surface cover plates matching floor plates.
- f. Use expansion fire inserts in fire rated walls, rated same as hour rating of wall.

D. Exterior Wall Joint Assemblies:

- 1. Variable movement with seal designed to prevent water and air infiltration.
- 2. Use vinyl seal strip as secondary seal behind primary seal.
- 3. Cover Plate Assemblies:
 - a. Surface mounted cover plate.
 - b. Concealed frame for fastening to wall on one side of joint.
 - c. Extend cover to lap each side of joint and to permit free movement on one side.
 - d. Provide concealed attachment of cover to frame for cover with cover in close contact with adjacent finish surfaces.
 - e. Use angle cover plate of intersection of walls.
- 4. Extruded thermoplastic rubber joint assemblies.
 - a. Aluminum frames both sides of joint.
 - 1) Designed to receive flexible rubber primary seal on exposed face after installation of frame.
 - 2) Designed to receive continuous secondary vinyl sheet seal.
 - 3) Anchor spaced at ends and not over 600 mm (24-inches).
 - b. Variable movement extruded rubber primary seal designed to remain in aluminum frame, throughout movement of joint.
 - 1) Flush mounted seal minimum 3 mm (0.125 inch) thick with dual movement grooves designed for plus or minus 50 percent, movement of joint width.
 - 2) Seismic seal minimum 3 mm (0.125 inch) thick with multi-movement grooves designed for plus or minus 100 percent movement of joint width.
 - 3) Recessed front face seal minimum 3 mm (0.125 inch) thick with no movement grooves, designed for plus or minus 50 percent movement of joint width.
 - c. Provide factory heat welded transitions where directional changes occur to ensure a watertight system.
 - d. Provide pantographic wind load supports, maximum 2400 mm (8 feet) on center to support seal systems of 300 mm (12 inches) and wider.

2.3 METAL FINISHES

A. General:

- 1. Apply finishes in factory after products are fabricated.
- 2. Protect finishes on exposed surfaces with protective covering before shipment.

B. Aluminum Finishes:

- 1. Finish letters and numbers for anodized aluminum are in accordance

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with the NAAMM AMP 501, Aluminum Association's Designation System.

- a. Clear anodized finish: AA-C22A41 Chemically etched medium matte, clear anodic coating, Class I Architectural, 0.7 - mil thick.
2. Factory-Primed Concealed Surface: NAAMM AMP 505 Protect concealed aluminum surfaces that will be in contact with plaster, concrete or masonry surfaces when installed by applying a shop coat of zinc-molybdate primer to contact surfaces. Provide minimum dry film thickness of 2.0 mils.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Manufacturer's representative shall make a thorough examination of surfaces receiving work of this section.
- B. Before starting installation, notify Prime Contractor of defects which would affect satisfactory completion of work.

3.2 PREPARATION

- A. Verify measurements and dimensions at job site and cooperate in coordination and scheduling of work with work of related trades.
- B. Give particular attention to installation of items embedded in concrete and masonry so as not to delay job progress.
- C. Provide templates to related trade for location of support and anchorage items.

3.3 INSTALLATION

- A. Install in accordance with manufacturers installation instructions unless specified otherwise.
- B. Provide anchorage devices and fasteners for securing expansion joint assemblies to in-place construction including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete. Provide metal fasteners of type and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.
- C. Perform cutting, drilling and fitting required for installation of expansion joint cover assemblies.
- D. Install joint cover assemblies in true alignment and proper relationship to expansion joint opening and adjoining finished surfaces measured from established lines and levels.
- E. Allow for thermal expansion and contraction of metal to avoid buckling.
- F. Set floor covers at elevations flush with adjacent finished floor materials

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unless shown otherwise.

- G. Material and method of grouting floor frames set in prepared recesses in accordance with manufacturer's instructions.
- H. Locate wall, ceiling and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories.
- I. Locate anchors at interval recommended by manufacturer, but not less than 75 mm (3- inches) from each ends, and, not more than 600 mm (24-inches) on centers.
- J. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints.
- K. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames or plates.
- L. Flush Metal Cover Plates:
 - 1. Secure flexible filler between frames so that it will compress and expand.
 - 2. Adhere flexible filler materials to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- M. Waterstops:
 - 1. Install in conjunction with floor joints and where shown, run continuously to prevent water damage to finish spaces.
 - 2. Provide seal with frame to prevent water leakage.
 - 3. Provide outlet tubes from waterstops to drain to prevent damage to finish spaces.
- N. Fire Barriers:
 - 1. Install in compliance with tested assembly.
 - 2. Install in floors and in fire rated walls.
 - 3. Use fire barrier sealant or caulk supplied with system.
- O. Sealants:
 - 1. Install to prevent water and air infiltration.
- P. Vertical Exterior Extruded Thermoplastic Rubber.
 - 1. Install side frames mounted on sealant or butyl caulk tape with appropriate anchors 600 mm (24 inches) on center complete with independent continuous PVC back seal.
 - 2. Install primary seals retained in extruded aluminum side frames.
- Q. Installation of Extruded Thermoplastic Rubber or Seals:
 - 1. For straight sections, provide preformed seals in continuous lengths.

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2. Vulcanize or heat-seal field splice joints to provide watertight joints using manufacturer's recommended procedures.

R. Installation of Preformed Elastomeric Sealant Joint:

1. Locate joint directly over joints in wall or floor substrates.
2. Full length shall be fastened to substrate using a construction adhesive.
3. Install flush or slightly below finish material.

3.4 PROTECTION

- A. Take proper precautions to protect the expansion joint covers from damage after they are in place.
- B. Cover floor joints with plywood where wheel traffic occurs.

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 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. 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. Frames fabricated of structural steel: Section 05 50 00, METAL FABRICATIONS.
- D. Aluminum frames entrance work: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- E. Door Hardware: Section 08 71 00, DOOR HARDWARE.
- F. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- G. Card readers and biometric devices: Section 28 13 00, ACCESS CONTROL.
- H. Intrusion Alarm: Section 28 16 11, INTRUSION DETECTION SYSTEM.
- I. 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 exterior doors: Fabricate from 1.7 mm (0.067 inch) thick galvanized steel conforming to ASTM A525.
3. 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

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steel removable stop sections for access to concealed face plates and control valves, except when cover plates are furnished with closer.

C. Glazed Openings :

1. Integral stop on exterior, 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 (24 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.

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- f. Anchors for observation windows and other 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.
 - 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.

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- E. Frames for Sound Rated Doors: Coordinate to line frames for sound rated doors with insulation.

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. 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. Metal door frames: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- D. Overhead coiling doors: Section 08 34 10, COILING COUNTERTOP DOORS.
- E. Blast resistant rated: Section 08 56 53, BLAST RESISTANT FAÇADE SYSTEMS
- F. Door hardware including hardware location (height): Section 08 71 00, DOOR HARDWARE.
- G. 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.
- H. Glazing and ballistic rated glazing: Section 08 80 00, GLAZING.
- I. Finish: Section 09 06 00, SCHEDULE FOR FINISHES.
- J. Card readers and biometric devices: Section 28 13 00, PHYSICAL ACCESS CONTROL SYSTEMS
- K. 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

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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:

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):

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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
 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

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- 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.
- 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:

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- 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.
 - 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.
 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

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09 06 00 SCHEDULE FOR FINISHES.

2.3 IDENTIFICATION MARK:

- A. On top edge of door.
- 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

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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 style of active leaf of pair of doors 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 17 10**INTEGRATED DOOR ASSEMBLIES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Work in this section includes integrated door opening systems including metal frame, integrated doors, hanging device, latching mechanism and associated finish hardware, unless specified elsewhere.
- B. Smoke and draft control seals shall be included in this section, unless specifically listed elsewhere.
- C. All glass and glazing are not covered in this section.

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. Blocking for Hardware: Section 06 10 00, ROUGH CARPENTRY.
- D. Key Cylinders: Section 08 71 00, DOOR HARDWARE
- E. [Auto Door Operators: Section 08 71 13.11, LOW ENERGY DOOR OPERATORS.
- F. Painting: Section 09 91 00, PAINTING.
- G. Card Readers: Section 28 13 11, PHYSICAL ACCESS CONTROL SYSTEMS.
- H. Electrical: Division 26, ELECTRICAL.
- I. Fire Detection: Section 28 31 00, FIRE DETECTION AND ALARM.

1.3 QUALITY ASSURANCE

- A. Hardware shall be installed by people knowledgeable and skilled in the application, installation and adjustment of commercial grade doors and door hardware. Doors and Frames must be installed plumb, square and level.
- B. Doors frames must be properly prepared and reinforced to install hardware per the manufacturer's template and installation instructions. Install door frames in accordance with ANSI/SDI A250.11 - "Recommended Erection Instructions for Steel Frames."

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- C. Contractor shall provide and furnish screws, bolts, expansions shields or other fasteners to facilitate the proper installation of products, not furnished as part of the Integrated Door Assembly.

1.4 WARRANTY

- A. Provide manufacturer's standard five-year limited warranty against defects in material and workmanship unless noted otherwise.
 - 1. Door Closers: 10 years
 - 2. Steel Pinned Continuous Hinges: 10 years

1.5 SUBMITTALS

- A. Submit shop drawings with proposed Integrated Door Assembly system, product and hardware options, in a timely manor to obtain the approval from architect in time to meet construction schedule of other trades.
- B. Provide for each door an frame location; frame type, profile, and installation details, items of finish hardware accessories, finishes, degree of opening and electrical rough-in requirements. Submit required templates to door and frame manufacturers to enable proper and accurate sizing and locations of hardware.
- C. Samples: Provide physical samples as required by Section 01 33 23.
- D. Provide Owner Manual, instruction sheets and installation.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Integrated Door Assembly systems shall be delivered to the general contractor at the job site complete with necessary screws, miscellaneous parts, instructions, and installation templates. Each package shall be legibly and properly labeled to correspond to the approved door schedule.
- B. Deliver Integrated Door Assembly system to project site. Contractor will jointly check in hardware with representatives of the supplier to verify shipment is correct and / or note and rectify discrepancies promptly.
- C. Furnish door assemblies with flush operating hardware flush with door skin, using protective wrappings and protective spacers between projecting hardware. Maintain and protect door assemblies using cardboard spacers and protective edge guards along the door edges, to reduce exposure to marring or damage during storage.
- D. Store door assemblies in a dry and secure area. Storage area shall be void of any excess humidity that can cause damage to the product.

1.7 INSTRUCTIONS

- A. 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:

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Adams-Rite	Adams Rite Mfg. Co.	Pomona, CA
G.E. Security	GE Security, Inc.	Bradentown, FL
Pemko	Pemko Manufacturing Co.	Ventura, CA

1.8 APPLICABLE PUBLICATIONS

- A. The following references established standards for architectural hardware as specified in this section.
- B. American National Standards Institute (ANSI)
1. ICC/ANSI A117.1-2003 Accessible and Usable Buildings and Facilities
 2. ANSI/BHMA A156.1-2006 Butts and Hinges
 3. ANSI/BHMA A156.3-2008 Exit Devices
 4. ANSI/BHMA A156.4-2008 Door Controls - Closers
 5. ANSI/BHMA A156.5-2001 Auxiliary Locks and Associated Products
 6. ANSI/BHMA A156.6-2005 Architectural Door Trim
 7. ANSI/BHMA A156.7-2009 Template Hinge Dimensions
 8. ANSI/BHMA A156.8-2005 Door Controls - Overhead Holders
 9. ANSI/BHMA A156.10-2005 Power Operated Pedestrian Doors
 10. ANSI/BHMA A156.13-2002 Mortise Locks and Latches
 11. ANSI/BHMA A156.15-2006 Closer Holder Release Devices
 12. ANSI/BHMA A156.16-2008 Auxiliary Hardware
 13. ANSI/BHMA A156.18-2006 Materials and Finishes
 14. ANSI/BHMA A156.19-2007 Power Assist and Low Energy Power Operated Doors
 15. ANSI/BHMA A156.21-2009 Thresholds
 16. ANSI/BHMA A156.22-2005 Door Gasketing Systems
 17. ANSI/BHMA A156.23-2004 Electromagnetic Locks
 18. ANSI/BHMA A156.24-2003 Delayed Egress Locking Systems
 19. ANSI/BHMA A156.25-2007 Electrified Locking Devices
 20. ANSI/BHMA A156.26-2006 Continuous Hinges
 21. ANSI/BHMA A156.28-2007 Master Keying Systems
 22. ANSI/BHMA A156.29-2007 Exit Locks and Alarms
 23. ANSI/BHMA A156.30-2003 High Security Cylinders
 24. ANSI/BHMA A156.31-2007 Electric Strikes and Frame Mounted Actuators
 25. ANSI/BHMA A156.32-2008 Integrated Door Opening Assemblies

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26. ANSI/SDI A250.4-2001 Test Procedure and Acceptance Criteria for Physical Evidence for Steel Doors, Frames, Frame Anchors and Reinforcings
 27. ANSI/SDI A250.8-2003 Recommended Specifications for Standard Steel Doors and Frames
 28. ANSI/SDI A250.11-2001 Recommended Erection Instructions for Steel Frames
 29. UL10C-2009 Positive Pressure Fire Tests of Door Assemblies
- C. American Society for Testing and Materials (ASTM)
1. ASTM E2074 (2000): Standard Test Method for Fire Tests of Door Assemblies
 2. ASTM E2180 (2007): Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) In Polymeric or Hydrophobic Materials
 3. ASTM F476 (2002): Standard Test Method for Security of Swinging Door Assemblies
- D. Door and Hardware Institute (DHI)
1. Recommended Locations for Builder's Hardware for Standard Doors and Frames (2004)
 2. Recommended Locations for Builder's Hardware for Custom Steel Doors and Frames (1996)
- E. Metal Door and Frame Associations
1. Hollow Metal Manufacturing Association (HMMA)
 - a. National Association of Architectural Metal Manufacturers (NAAMM)
 2. Steel Door Institute (SDI)
- F. Approved Testing Laboratories
1. Underwriter's Laboratories, Inc. (UL)
 - a. UL305 (2007): Panic Hardware
 - b. UL1784 (2004): Air Leakage Tests of Door Assemblies
 2. ITS / Intertek Testing Services / Warnock Hersey Inc.
- G. National Fire Protection Association (NFPA)
1. NFPA 70-2008: National Electrical Code
 2. NFPA 80-2010: Standard for Fire Doors and Other Opening Protectives
 3. NFPA 101-2009: Life Safety Code
 4. NFPA 105-2010: Standard for Installation of Smoke Door Assemblies and Other Opening Protectives
 5. NFPA 252-2008: Standard Methods of Fire Tests of Door Assemblies

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H. Building Codes [Applicable Building Code]

1. 2009 International Building Code
2. All hardware shall comply with UFAS, (Uniform Federal Accessible Standards - 1998) unless specified otherwise

PART 2 - PRODUCTS**2.1 MATERIAL REQUIREMENTS**

A. Integrated Door Assembly requirements:

1. Integrated Door Opening Assemblies shall be 1-3/4" thick, with no seams or spot welds on door face and be of manufacturer's standard construction: Door face skins to be minimum [18][16]-gauge cold rolled steel. Door core construction to be [Honeycomb][Polystyrene][Steel Stiffened][Temperature Rise]. All doors shall be constructed with a U-Shaped, 16 gauge steel reinforcement channel, top and bottom, for the installation of door hardware accessories. All doors shall be supplied with an 18 gauge top cap.
2. Integrated Door Opening Assemblies shall provide a label for life safety or fire labels as required in door schedule.
3. Integral vision lite preparation, or field installed lite kit, as required.

B. Door Frame requirements:

1. Door Frames shall be [16][14]-gauge ASTM A366, cold roll steel and shall comply to ANSI/SDI A250.8 Level A - Grade III and / or HMMA/NAAMM - 850-99.
2. Door frames shall be furnished with mitered corners, continuously welded, ground smooth on frame face.
3. Prepare frames with proper 14 gauge reinforcements for applied hardware. Provide 12 gauge reinforcements for continuous hinges.
4. Provide suitable adjustable type anchors, minimum 4 per jamb.

C. Integrated Hardware Requirements:

1. Provide a complete Integrated Door Assembly including the installation and adjustment of the latching mechanism within the door construction. The exit device shall be inset in door, clean and unobtrusive in design. The push bar shall be made of heavy duty aluminum extrusion, with satin stainless steel (BHMA 630) cladding. End caps shall be metal, plated satin nickel (BHMA 619). The Push and Pull devices shall be clean and unobtrusive in design. Lever handles shall be clean and unobtrusive in design with and shall match style of other hardware furnished on project. The hinges shall be continuous pin-and-barrel type of stainless steel material for both hinge leaves and pin.
 - a. At doors with plastic laminate faces, provide hinges with wrap-around hinge guards and provide stainless steel wrap-around edge guards at the leading edge of the door.

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D. Performance Requirements:

1. Assembly performance test standards per ANSI/BHMA A156.32-2008:
Integrated Door Opening Assemblies
 - a. Grade 1: 1,000,000

2.2 FINISHES

A. Finish Symbols

	US	BHMA	DESCRIPTION OF FINISH
1.	USP	600	Primed for field painting
2.	US26D	626/652	Satin Chrome
3.	US28	628	Satin Aluminum
4.	US32	629	Bright Stainless
5.	US32D	630	Satin Stainless
6.	N/A	689	Aluminum Painted

B. Finish Requirements

1. Door Faces:[Prime][Factory Pre-Finished][Plastic Laminate]
2. Frames:[Prime][Factory Pre-Finished]
3. Door Hardware:
 - a. Continuous Hinges: 630
 - b. Push Bar: 630 clad with 619 end caps
 - c. Lever Exit Device Trim: 630
 - d. Push/Pull Trim: 626
 - e. Door Closers: 689
 - f. Miscellaneous: To match other finishes
4. 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.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Contractor is responsible for notification of any wall conditions or building structure that would prevent proper execution of the installation of products produced in accordance with approved hardware schedule.
- B. Note short or damaged deliveries on the bill of lading at the time of delivery.

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- C. The fire label is a manufacturer's certification only. Proper installation of products and proper wall construction are requirements to meet fire label.
- D. Verify that power supplies, as required, are available to power electrically operated devices.
- E. Do not fabricate any product until receipt of approved submittal drawings.
- F. Beginning of installation means acceptance of existing conditions.

3.2 INSTALLATION

- A. Mount furnished hardware accessories at heights indicated in "Recommended Locations or Builder's Hardware" for Standard Doors and Frames, Custom Steel Doors and Frames, established by the Door and Hardware Institute (DHI), except if otherwise indicated or to comply with requirements of governing regulations, or if otherwise directed by the architect.
- B. Install furnished hardware accessories in compliance with the manufacturer's instructions, templates and recommendations. Comply with specified degree of opening for doors with automatic operators, overhead door closers, etc. Securely fasten all furnished parts. Make sure all operating parts move freely and smoothly without binding, sticking and void of any excessive clearance.
- C. Coordinate installation and interface wiring with fire alarm and smoke detection systems.
- D. Remove or protect furnished hardware accessories, prior to any painting or finishing that is to be completed after the installation of the hardware accessories.

3.3 ADJUSTMENT AND CLEANING

- A. Adjust and check door assembly and each operating item of hardware to ensure correct operation and function. Units which cannot be adjusted to operate as intended for the application made shall be replaced.
- B. Final Adjustment: Wherever hardware installation is made more than a month prior to building acceptance or occupancy of a space or area, the installer shall return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items. Hardware Accessories shall be cleaned as necessary to restore correct operation, function, and finish. Do not use cleaners that will harm finish.

3.4 PROTECTION

- A. Whenever furnished hardware accessories are located in areas where it may be subject to damage during construction by handling, cleaning, etc., (e.g. painting, cleaning of bricks) it shall be protected and/or removed from its location until the hazardous condition is terminated.

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3.5 SCHEDULES:

- A. The following is a general listing of the Integrated Door Assembly requirements and is not intended for use as a final door submittal. Any items of hardware required by established standards or practices, or to meet federal building codes shall be furnished whether or not specifically called out in the following listed groups.

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.

HW-6D

Each [ADO] Integrated Door to Have:	RATED
1 Steel Frame	
1 Integrated Door w/Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E04) x F08 LEVER
1 Continuous Transfer Hinge	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

Each [ADO] Integrated Door to Have:

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-8

Each [MHO] Pair Integrated Doors to Have:	RATED
1 Steel Frame	

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Integrated Pair Doors w/Auto Flush Bolts & Push/Pull Trim	Q2241 x TYPE 25 LESS BOTTOM BOLT AUTO FLUSH BOLT (INACTIVE LEAF) x ACTIVE CONCEALED VERTICAL LATCH (ACTIVE LEAF)
2 Continuous Hinges	A51031B x WIDE THROW AS REQUIRED TO ACHIEVE FULL DOOR SWING
1 Coordinator	TYPE 21A
1 Self-Adhesive Astragal	R0Y_14
2 Closers	C02011 (PT4D, PT4H) x 180° SWING
2 Magnetic Holders	C00011 TRI-VOLTAGE
1 Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-12A

Each [MHO] Pair Integrated Doors to Have:	RATED
1 Steel Frame	
Integrated Pair Doors w/Exit Devices and Pull Trim	Q2231 x TYPE 8 EXIT DEVICES (F01 / ACTIVE FLUSH PULL PASSAGE TRIM)
2 Continuous Hinges	A51031B
1 Self-Adhesive Astragal	R0Y_14
2 Closers	C02011/C02021 (PT4D, PT4H)
2 Magnetic Holders	C00011 TRI-VOLTAGE
1 Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-12B

Each [ADO] Pair Integrated Doors to Have:	RATED
1 Steel Frame	
Integrated Pair Doors w/Elec Exit Devices	Q2231 x TYPE 8 (E04) ELECTRIC EXIT DEVICES (F01 / F08)
2 Continuous Transfer Hinges	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION

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1	Self-Adhesive Astragal	R0Y_14
2	Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2	Floor Stops	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-12C

Each [ADO] Pair Integrated Double Egress Doors to Have:		RATED
1	Steel Frame	
	Integrated Pair Doors w/Exit DEVICES	Q2331 x TYPE 8 EXIT DEVICES (F01)
2	Continuous Hinges	A51031B
	Overlapping Astragal with Self-Adhesive Seal	R5Y634 x R0E154 x THRU-BOLTS
2	Closers	C02011/C02021 (PT4D, PT4H
2	Magnetic Holders	C00011 TRI-VOLTAGE
1	Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

HW-12D

Each [ADO] Pair Integrated Double Egress Doors to Have:		RATED
1	Steel Frame	
	Integrated Pair Doors w/Elec Exit Devices	Q2331 x TYPE 8 (E04) ELECTRIC EXIT DEVICES (F01)
2	Continuous Transfer Hinges	A51031B x 8-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1	Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
	Overlapping Astragal with	R5Y634 x R0E154 x THRU-BOLTS

Renovate Emergency Department Facilities

Self-Adhesive Seal	
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-12E - AUTOMATIC SLIDING HURRICANE IMPACT DOORS W/BREAK-AWAY

Each [ADO] Pair Integrated Double Egress Doors to Have:	NOT RATED
1 ALUM W/ Steel	
Integrated Pair Doors w/Elec Exit Devices	Automatic, Fail Safe ELECTRIC EXIT DEVICES (F01)w/ inset panic bar for breakaway
2 Sliding Doors by manufacturer	w/ ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR.
2 10" min bottom rail for accessibility	Integrated, Alum, by manufacturer
1 Set Seals	By manufacturer

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-SH-4

Each [AC, EL, REX, DPS] Integrated Door to Have:	RATED
1 Steel Frame	
Integrated Door w/Elec. Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E05/E06-VERIFY)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL

Renovate Emergency Department Facilities

1	Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1	Closer	C02021 (PT4D, PT4F, PT4H)
1	Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1	Floor Stop	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0E154
1	Alarm Contact	1078-G (G.E. Security), or Equal

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

HW-SH-4A

Each [ADO, AC, ELR, REX, DPS] Integrated Door to Have:	RATED
1 Steel Frame	
Integrated Door w/Elec Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E04)x F13 LEVER
1 Continuous Transfer Hinge	A51031B x 12-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Floor Stop	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154
1 Alarm Contact	1078-G (G.E. Security), or Equal

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

CARD READER BY DIVISION 28.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING
(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

HW-SH-10

Each [AC, EL, REX, DPS] Pair Integrated Doors to Have	RATED
1 Steel Frame	

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Integrated Pair Doors w/Elec Exit Devices	Q2231 x TYPE 8 EXIT DEVICES (F01-E01 / F13-E01, E05/E06-VERIFY)
2 Continuous Transfer Hinges	A51031B x 4-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE
1 Self-Adhesive Astragal	R0Y_14
2 Closers	C02021 (PT4D, PT4F, PT4H)
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

POWER, WIRING, AND CONDUIT BY DIVISION 26.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

HW-SH-10A

Each [AC, ADO, EL, REX, DPS] Pair Integrated Doors to Have:	RATED
1 Steel Frame	
Integrated Pair Doors w/Elec. Exit Devices	Q2231 x TYPE 8 (E01, E04) ELECTRIC EXIT DEVICES (F01 / F08)
2 Continuous Transfer Hinges	A51031B x 12-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1 Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1 Self-Adhesive Astragal	R0Y_14
2 Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2 Floor Stops	L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0E154

POWER, WIRING, CONDUIT, AND FIRE ALARM CONNECTION BY DIVISION 26.

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

AUTO DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR OPERATORS.

HW-SH-12

Each [AC, ADO, EL, REX, DPS] Integrated Door to Have:	NON-RATED
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Renovate Emergency Department Facilities

1	Steel Frame	
	Integrated Door w/Elec. Exit Device	Q2131 x TYPE 8 ELECTRIC DEVICE (E01, E04) x F03 OUTSIDE CYLINDER ONLY
1	Continuous Transfer Hinge	A51031B x 12-THRUWIRE TRANSFER x IN-HINGE ACCESS PANEL
1	Power Supply	BY EXIT DEVICE MFR. FOR E04 FUNCTION
1	Offset Pull	J402 x 1" (25mm) DIAMETER x 12" (305mm)CTC
1	Closer	C02021 (PT4D, PT4F, PT4H
1	Kick Plate	J102
1	Floor Stop	L02121 x 3 FASTENERS
1	Threshold	J35130 x SILICONE GASKET
1	Door Sweep	90100CNB (PEMKO), OR EQUAL
1	Set Frame Seals	2891AS X CSK SCREWS (PEMKO), OR EQUAL
1	Drip	R0Y976
1	Alarm Contact	1078-G (G.E. Security), or Equal

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

KEY CYLINDER BY SECTION 08 71 00, DOOR HARDWARE.

- - - E N D - - -

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. 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. Wire mesh and screen access doors: Section 05 50 00, METAL FABRICATIONS.
- D. Lock Cylinders: Section 08 71 00, DOOR HARDWARE.
- E. Access doors in acoustical ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.
- F. Access doors in gypsum board walls and ceilings: Section 092900, GYPSUM BOARD; and SECTION 092216, NON-STRUCTURAL METAL FRAMING.
- G. 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

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- C. American Welding Society (AWS):
 - 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.

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3. Provide expanded galvanized metal lath perimeter wings when installed 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. Door Panel:

1. Form of 1.9 mm (0.0747 inch) thick steel sheet.
2. Reinforce to maintain flat surface.

B. Frame:

1. Form of 1.5 mm (0.0598 inch) thick steel sheet of depth and configuration to suit material and type of construction where installed.
2. Provide surface mounted units having frame flange at perimeter where installed in concrete, masonry, or gypsum board construction.
3. Weld exposed joints in flange and grind smooth.
4. Provide expanded galvanized metal lath perimeter wings when installed in plaster except veneer plaster.

C. Hinge:

1. Concealed spring hinge to allow panel to open 175 degrees.
2. Provide removable hinge pin to allow removal of panel from frame.

D. Lock:

1. Flush, screwdriver operated cam lock.
2. Provide tamper proof screws (spanner head locks) for access panels in Psychiatric Areas.

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.

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2.5 SIZE:

- A. Minimum 600 mm (24 inches) square door unless otherwise shown or required to suit opening in suspension system of ceiling.

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.

Renovate Emergency Department Facilities

- 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.
- 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 08341
COILING DOORS**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Section specifies motor operated overhead roll up coiling doors and coiling doors over counter in walls.

1.2 RELATED WORK

- A. Lock cylinder and keying: Section 08 71 0, BUILDERS HARDWARE.
- B. Electric devices including smoke detectors and wiring: DIVISION 26, ELECTRICAL.

1.3 MANUFACTURER'S AND INSTALLER'S QUALIFICATIONS

- A. Coiling doors shall be products of manufacturers regularly engaged in manufacturing items of type specified.
- B. Install items under direct supervision of manufacturer's representative or trained personnel.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:
 - 1. Brochures or catalog cuts, each type coiling door.
 - 2. Manufacturer's installation procedures and instructions.
 - 3. Maintenance instructions, parts lists.
- C. Shop Drawings:
 - 1. Each type of coiling door showing details of construction, accessories and hardware, electrical and mechanical items supporting brackets for motors, location, and ratings of motors, and safety devices.
 - 2. Wiring diagrams for motors and controls, including wiring diagram for coiling door, showing electrical interlock of motor with manually operated dead lock, electrical rough-in.

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):

A53-06.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated
Welded and Seamless

- A653/A653M-07.....Steel Sheet Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot Dip Process
- F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
- F593-02.....Stainless Steel Bolts, Hex Cap Screws, and Studs
- C. American Welding Society (AWS):
- D1.1-04.....Structural Welding Code Steel
- D1.3-98.....Structural Welding Code Sheet Steel
- D. National Fire Protection Association (NFPA):
- 70-08.....National Electrical Code
- 80-06.....Fire Doors and Fire Windows
- E. National Electrical Manufacturers Association (NEMA):
- ICS 1-00(R2005).....Industrial Control and Systems General Requirements
- ICS 2-00(R2005).....Industrial Control, and Systems, Controllers, Contactors, and Overload Relays
- ICS 6-93 (R2006).....Industrial Control and Systems Enclosures
- MG 1-06.....Motors and Generators
- ST 20-92 (R1997).....Dry-Type Transformers for General Applications

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Galvanized Repair Compound: Mil. Spec MIL-P-21035.
- B. Galvanized Steel: ASTM A653.
- C. Steel Pipe: ASTM A53.
- D. Casting: ASTM A47 or A48.
- E. Finish Materials: As required to achieve the specified finish.

2.2 DESIGN REQUIREMENTS

- A. Coiling doors shall be spring counter balanced, overhead coiling type, inside face mounted with guides at jambs set back a sufficient distance to provide a clear opening when door is in open position.
- B. Fire rated doors shall conform to the requirements specified herein and to NFPA 80 for the class indicated. Doors shall bear Underwriters Laboratories, Inc. label or other nationally recognized laboratory label indicating the applicable fire rating.
- C. Operation: Motor with key operated controls.
 - 1. Door to operate at speed of 2/3 feet per second.
 - 2. Motor to be of size to properly operate door.
 - 3. Motor operator to include geared limit switch and an electrically interlocked emergency chain operator.
 - 4. Motor to be operated by three button station as described in the Electric Motor Operation Article of this Section.
- D. Automatic Closing Device and Governor:
 - 1. Activation of time-delayed release device by smoke or ionization detector shall cause automatic closing of door to meet fire resistive rating of opening.
 - 2. Door shall have constant closing speed of not less than 6 inches per second and not more than 24 inches per second per NFPA 80.
 - 3. Door shall close due to activation by smoke detector signal, central alarm system signal, loss of power, and melting of fusible link and shall not require physical resetting for any reason.
- E. Motor Operator System:
 - 1. Allow for testing of fire doors without ever mechanically resetting the release mechanism.
 - 2. If there is an obstruction in the opening, door shall automatically open, activate the voice module, and close again.
 - 3. During power failure, fire door will automatically close.
 - 4. Fire door shall never need to be mechanically reset and testing can be performed by any individual by activating alarm system.
- F. Safety Edge: As described in the Electric Motor Operation Article of this Section

2.3 FABRICATION

- A. Weld in accordance with AWS applicable code.
- B. Fire Rated Coiling Door:
 - 1. Motor operated coiling door and frame for installation with related accessories and components, and automation closing by fusible link
 - 2. Construct for surface mounted installation.
 - 3. Curtain:
 - a. Minimum 22 gauge galvanized steel interlocking slats not more than 1-1/2 inches wide.
 - b. Bottom bar equipped with recessed flush handles, recessed slide bolt on one end, key operated cylinder lock on other end and a continuous flexible seal to make contact with floor or counter. Lock cylinder specified in Section 08 71 00, DOOR HARDWARE.

4. Lock: Cylindrical lock in bottom bar, electrically interlocked to prevent motor from operating when door is locked.
5. Hood: Minimum 24 gauge galvanized steel.
6. Guides: Manufacturer's standard, steel.

2.4 ELECTRIC MOTOR OPERATORS

- A. Provide operators complete with electric motor, machine cut reduction gears, steel chain and sprockets, magnetic brake, overload protection, brackets, push button controls, limit switches, magnetic reversing contactor, and other accessories necessary for proper operation including emergency manual operator.
- B. Design: Design the operator so that the motor may be removed without disturbing the limit-switch timing and without affecting the emergency manual operators.
- C. Motors:
 1. Motors shall conform to NEMA MG1, suitable for operation on current of the characteristics indicated, and shall operate at not more than 3600 rpm.
 2. Motors shall be high starting torque, reversible type, of sufficient horsepower and torque output to move the door in either direction from any position, and produce a door travel speed of not less than 0.66 foot or more than one foot per second, without exceeding the rated capacity.
- D. Controls:
 1. The control equipment shall conform to NEMA ICS 1 and 2.
 2. Control enclosures shall be NEMA ICS 6, Type 12 or Type 4, except that contractor enclosures may be Type 1.
 3. Remote control switches shall be at least 1500 mm (5 feet) above the floor line, and located so that the operator will have complete visibility of the door at all times.
 4. Each door motor shall have an enclosed, across-the-line type, magnetic reversing contactor, thermal overload protection, solenoid operated brake, limit switches, and remote control switches at locations shown.
 5. Use three-button type, push button switch on interior, unless noted to be key activated, with the buttons marked, OPEN, CLOSE, and STOP.
 - a. The OPEN and STOP buttons shall be of the type requiring only momentary pressure to operate. The CLOSE button shall be of the type requiring constant pressure to maintain the closing motion of the door. When the door is in motion, and the STOP button is pressed, the door shall stop instantly and remain in the stop position; from the stop position, the door may then be operated in either direction by the OPEN or Close buttons.
 - b. Push buttons shall be full-guarded to prevent accidental operation.
 6. Provide limit switches to automatically stop the doors at their fully open and closed positions. Positions of the limit switches shall be readily adjustable.
 7. Safety device:
 - a. Install safety edge on bottom bar of door.

- b. The bottom bar of power-operated doors shall have a fail safe safety device that will immediately stop and reverse the door in its closing travel upon contact with an obstruction in the door opening, or upon failure of the device, or any component of the device, or any component of the control system, and cause the door to return to its full open position. The door closing circuit shall be electrically locked out, and the door shall be operable manually until the failure or damage has been corrected.
 - c. Safety device shall not be used as a limit switch.
 - d. Safety edge to consist of rubber boot attached below bottom bar with electrical switch secured to back of bottom bar.
 - e. Safety edge to operate with air wave technology and shall not rely on pneumatic pressure or electrical strip contacts to operate properly
 - f. Operation of safety edge shall not be subject to interference's by temperature, barometric pressure, water infiltration, or cuts in rubber boot.
8. Transformer:
- a. Provide a control transformer in power circuits as necessary to reduce the voltage on the control circuits to 120 volts or less.
 - b. The transformer shall conform to NEMA ST20.
9. Electrical components shall conform to NFPA 70.

2.5 FINISH

- A. Galvanized Steel (Curtain, Hood and Guides):
- 1. Hot-dip galvanize in accordance with ASTM A653/A653M, coating designation G90; bonderize for prime coat adhesion, apply powder coating finish
 - 2. Color: As selected by Contracting Officer's Representative from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with approved shop drawings and manufacturer's instructions.
- B. Install fire-rated doors in accordance with NFPA 80 and requirements for fire listing.
- C. Locate anchors and inserts for guides, brackets, supports, hardware, and other accessories and components accurately.
- D. Securely attach guides to adjoining construction with not less than 10 mm (3/8-inch) diameter bolts, spaced near each end and not over 600 mm (24 inches) apart.
 - 1. Use fasteners conforming to ASTM F468 and F593.
 - 2. Use stainless steel bolts with aluminum or stainless steel.
 - 3. Use toggle bolts to frame walls or hollow masonry.
 - 4. Use expansion bolts in solid masonry or concrete.

E. Locate control switches where shown or directed.

F. Install all electric devices and wiring as specified in DIVISION 16
ELECTRICAL.

3.2 REPAIR

A. Repair damaged zinc-coated surfaces by applying galvanized repair
compound in accordance with the manufacturer's directions.

3.3 ADJUSTING AND CLEANING

A. Adjust doors, hardware, and operating assemblies for smooth and noiseless
operation.

B. Test fire-rated doors for proper activation

C. Lubricate properly, adjust and demonstrate, to operate freely and as
specified.

D. Upon completion, ensure doors are free from warp, twist, or distortion,
and are lubricated and properly adjusted to operate freely.

E. Clean upon completion.

- - - E N D - - -

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, interior ICU sliding doors, and other components to make a complete assembly.

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. Glass and Glazing: Section 08 80 00, GLAZING.
- D. Hardware: Section 08 71 00, DOOR HARDWARE.
- E. Automatic Door Operators: Section 08 71 13.11, LOW ENERGY POWER ASSIST DOOR OPERATORS.
- F. 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.

Renovate Emergency Department Facilities

E. Manufacturer's Certificates:

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

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Aluminum Extrusions and Panels

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.

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- D. Make provisions in doors and frames to receive the specified hardware and 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

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tight when door is operated.

- 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.

- - - E N D - - -

SECTION 08 42 43**INTENSIVE CARE UNIT/CRITICAL CARE UNIT ENTRANCES****PART 1 - GENERAL****a. DESCRIPTION**

- A. Doors and hardware and related items necessary for complete installation and operation of ICU/CCU doors.

b. RELATED WORK

- A. Caulking: Section 07 92 00 JOINT SEALANTS.
- B. Glazing: Section 08 80 00, GLAZING
- C. Finishes: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. Painting: Section 09 91 00, PAINTING.
- E. Electrical: Division 26, ELECTRICAL.

c. 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 Exit Doors: Conform to requirements of NFPA 101, 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 doors and frames shall be made to standard templates. Furnish templates to the fabricator of these items in sufficient time so as not to delay the construction.
- E. The following standards form a part of this specification to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation:

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American Society for Testing and Materials (ASTM):

- d. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- e. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

International Organization for Standardization (ISO):

- f. ISO 9001 - Quality Management Systems

National Fire Protection Association (NFPA):

- g. NFPA 105 - Standard for the Installation of Smoke Door Assemblies

Underwriters Laboratories (UL):

- h. UL 1784 - Air Leakage Tests for Door Assemblies

National Association of Architectural Metal Manufacturers (NAAMM):

- i. Metal Finishes Manual for Architectural and Metal Products.

American Architectural Manufacturers Association (AAMA):

- j. AAMA 607.1 - Clear Anodic Finishes for Architectural Aluminum.
- k. AAMA 701 Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals.

1.2 PERFORMANCE REQUIREMENTS

2.General: Provide ICU/CCU entrances capable of withstanding structural loads and thermal movements based on testing manufacturer's standard units in assemblies similar to those indicated for this Project.

3.Thermal Movements: Provide ICU/CCU entrances that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

- a. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.3 SUBMITTALS

1.3.1 General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.

1.3.2 Shop Drawings: Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1.3.3 Color Samples for selection of factory-applied color finishes.

1.3.4 Closeout Submittals:

1.3.4.1 Owner's Manual.

1.3.4.2 Warranties.

A. ICU/CCU entrances shall be free of defects in material and workmanship for a period of one (1) year from the date of substantial completion.

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- B. During the warranty period the Owner shall engage a factory-trained technician to perform service and affect repairs. A safety inspection shall be performed after each adjustment or repair and a completed inspection form shall be submitted to the Owner.

During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal working hours.

1.4 QUALITY ASSURANCE

- 1.4.1 Installer Qualifications: Manufacturer's authorized representative, with certificate issued by AAADM, who is trained for installation and maintenance of units required for this Project.
- 1.4.2 Manufacturer Qualifications: A qualified manufacturer with a manufacturing facility certified under ISO 9001.
- 1.4.3 Manufacturer shall have in place a national service dispatch center providing 24 hours a day, 7 days a week, emergency call back service.
- 1.4.4 Certifications: ICU/CCU entrances provided as an effective barrier against the passage of smoke shall be UL 1784 listed.
- 1.4.5 Source Limitations: Obtain ICU/CCU entrances through one source from a single manufacturer.
- 1.4.6 Product Options: Drawings indicate sizes, profiles, and dimensional requirements of ICU/CCU entrances and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1.4.6.1 MAINTENANCE MANUALS

- 1.4.6.1.1 In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS", furnish maintenance manuals and instructions on all door hardware.

1.4.6.2 DELIVERY AND MARKING

- 1.4.6.2.1 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.

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1.4.6.3 PREINSTALLATION MEETING

1.4.6.3.1 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, Contracting Officer's Representative and VA Locksmith, Hardware Consultant, and Hardware Manufacturer's Representative. Review the following:

1. Inspection of door hardware.
2. Job and surface readiness.
3. Coordination with other work.
4. Protection of hardware surfaces.
5. Substrate surface protection.
6. Installation.
7. Adjusting.
8. Repair.
9. Field quality control.
10. Cleaning.

1.5 PROJECT CONDITIONS

1.5.1 Field Measurements: General Contractor shall verify openings to receive ICU/CCU entrances by field measurements before fabrication and indicate measurements on Shop Drawings.

1.5.2 Mounting Surfaces: General Contractor shall verify all surfaces to be plumb, straight and secure; substrates to be of proper dimension and material.

1.5.3 Other trades: General Contractor shall advise of any inadequate conditions or equipment.

1.6 COORDINATION

1.6.1 Templates: Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing ICU/CCU entrances to comply with indicated requirements.

Electrical System Roughing-in: Coordinate layout and installation of ICU/CCU entrances with connections to facility grounding system.

2 PRODUCTS**SCHEDULE 2 - ICU/CCU ENTRANCES**

1.Product: Telescopic, Trackless manual sliding ICU/CCU entrances with full breakout. Minimum clear opening for first or first and second panel slide is 44". (i.e. minimum clear opening width required prior to break-out is 44")

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SCHEDULE 3 - MATERIALS

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Headers, stiles, rails, and frames 6063-T6
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Sheet and Plate: ASTM B 209.
2. Sealants and Joint Fillers: Performed under Division 7 Section "Joint Sealants".

SCHEDULE 4 - ICU/CCU ENTRANCE ASSEMBLIES

1. General: Provide manufacturer's standard ICU/CCU entrance assemblies including doors, sidelights, framing, headers, carrier assemblies, roller tracks, pivots, and accessories required for a complete installation.
2. ICU/CCU Entrances:
 - a. Configuration: Two sliding panels and one full sidelight; telescoping.
 - b. Traffic Pattern: Two-way.
 - c. Breakaway Capability: Sliding panels and sidelight, from fully open position.
 - d. Mounting: Between jambs
 - e. Track: None; trackless.

SCHEDULE 5 - COMPONENTS

1. Framing Members: Manufacturer's standard extruded aluminum reinforced as required to support imposed loads.
 - a. Nominal Size: 1 ¾ inch by 6 inch (45 by 152 mm).
 - b. Concealed Fastening: Framing shall incorporate a concealed fastening pocket, and continuous flush insert cover, extending full length of each framing member.
2. Stile and Rail Doors and Sidelights: Manufacturer's standard 1 ¾ inch (45 mm) thick glazed doors with extruded-aluminum tubular stile and rail members. Incorporate concealed tie-rods that span full length of top and bottom rails.
 - a. Glazing Stops and Gaskets: Snap-on, extruded-security aluminum stops and preformed gaskets.
 - b. Stile Design: Narrow stile; 2 inch (51 mm) nominal width.
 - c. Bottom Rail Design: Minimum 4 inch (102 mm) nominal height.
 - d. Muntin Bars: None.
3. Glazing: Furnished under Division 8 Section Glazing. All Glazing furnished under separate section shall be 5/16" inch tempered and laminated.
4. Headers: Fabricated from extruded aluminum and extending full width of ICU/CCU entrance units to conceal carrier assemblies, and roller tracks. Provide hinged or removable access panels for service and adjustment of door carrier assemblies. Secure panels to prevent unauthorized access. Mounting shall be concealed, flush with framing.
5. Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment of at least 1/8 inch (3 mm); consisting of urethane with precision steel lubricated ball-bearing wheels,

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operating on a continuous roller track. Support panels from carrier assembly with load wheels and factory adjusted cantilever and pivot assembly and integrated anti-riser mechanism. Minimum two ball-bearing load wheels for each active leaf. Minimum load wheel diameter shall be 1 3/8 inch (35 mm).

6. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.

SCHEDULE 6 - HARDWARE

1. General: Provide units in sizes and types recommended by ICU/CCU entrance and hardware manufacturers for entrances and uses indicated.
2. Breakaway Feature: Provide release hardware that allows panel(s) to swing out in direction of egress to full 90 degrees. Maximum force to open panel shall be 50 lbf (222 N) with panel retaining bolts released. Limit arms shall be provided to control swing of non-sliding panels on break-out; swing shall not exceed 90 degrees.
3. Positive Latch: Manufacturer's standard non-keyed, spring loaded, latch and strike that can secure sliding door panels to adjacent panels or jambs. Strike shall mount flush to surface of framing. Latch shall engage by closing action of door.
4. Smoke Seal Components: Provide manufactures standard smoke and draft control components as required to meet performance specifications. Components included but are not limited to: Rubber stile, top rail, and hanger seals.
5. Pulls: Provide manufacturer's standard flush cup pulls, or if requested by the Contracting Officer's Representative, provide 10" accessible surface mounted pull.

SCHEDULE 7 - FABRICATION

1. General: Factory fabricate ICU/CCU entrance components to designs, sizes, and thickness indicated and to comply with indicated standards.
 - a. Form aluminum shapes before finishing.
 - b. Use concealed fasteners to greatest extent possible.
 - A. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
 - B. Reinforce members as required to receive fastener threads.
2. Framing: Provide ICU/CCU entrances as prefabricated assemblies.
 - a. Fabricate tubular and channel frame assemblies with manufacturer's standard mechanical or welded joints. Provide sub-frames and reinforcement as required for a complete system to support required loads.
 - b. Perform fabrication operations in manner that prevents damage to exposed finish surfaces.
 - c. Form profiles that are sharp, straight, and free of defects or deformations.
 - d. Prepare components to receive concealed fasteners and anchor and connection devices.
 - e. Fabricate components with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion.

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- 3.Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.
- 4.Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated.
- 5.Hardware: Factory install hardware to the greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site.

SCHEDULE 8 - ALUMINUM FINISHES

- 1.General: Comply with NAAMM Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designing finishes. Finish designations prefixed by AA comply with system established by Aluminum Association for designing finishes.
- 2.Class II, Clear Anodic Finish: AA-M12C22A31 Mechanical Finish: as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.40 mils minimum complying with AAMA 611-98, and the following:
 - a. AAMA 607.1
 - b. Applicator must be fully compliant with all applicable environmental regulations and permits, including wastewater and heavy metal discharge.

3 EXECUTION

3.2 INSPECTION

- 3.2.1 Examine conditions for compliance with requirements for installation tolerances, header support, and other conditions affecting performance of ICU/CCU entrances. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- 3.3.1 General: Do not install damaged components. Fit frame joints to produce joints free of burrs and distortion. Rigidly secure non-movement joints.
- 3.3.2 Entrances: Install ICU/CCU entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.
 - 3.3.2.1 Install surface-mounted hardware using concealed fasteners to greatest extent possible.
 - 3.3.2.2 Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
- 3.3.3 Grounding: Connect ICU/CCU entrances to building grounding system as specified in Division 16 Sections.
- 3.3.4 Glazing: Performed under Division 8 Section "Glazing" in accordance with ICU/CCU entrance manufacturer's instructions.

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3.3.5 Sealants: Comply with requirements specified in Division 7 Section "Joint Sealants".

3.4 FIELD QUALITY CONTROL

3.4.1 Testing Services: Factory Trained Installer shall test and inspect each ICU/CCU entrance to determine compliance of installed systems with applicable standards.

3.5 ADJUSTING

3.5.1 Adjust ICU/CCU entrances, and hardware for smooth and safe operation.

3.6 CLEANING AND PROTECTION

3.6.1 Clean glass and aluminum surfaces promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Repair damaged finish to match original finish. Comply with requirements in Division 8 Section "Glazing", for cleaning and maintaining glass.

END OF SECTION 08 42 43

SECTION 08 44 13**GLAZED ALUMINUM CURTAIN WALLS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section specifies glazed aluminum curtain wall system designed and constructed for blast-hazard mitigation.
 - 1. Type: Stick or unit system to include following:
 - a. Glass, Glass Spandrel Panels.
 - b. Sun shades
 - c. Integral reinforcing.
 - d. Closures, trim, subsills and flashings.
 - e. Fasteners, anchors, and related reinforcement.
 - f. Blast-hazard mitigation.

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. Structural steel: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- D. Miscellaneous metal members: Section 05 50 00, METAL FABRICATIONS.
- E. Firestopping between curtain wall and structure: Section 07 84 00, FIRESTOPPING.
- F. Parapets and exterior walls: Section 07 42 43, COMPOSITE WALL PANELS.
- G. Sheet metal flashing and trim: Section 07 60 00, FLASHING AND SHEET METAL.
- H. Joint sealants: Section 07 92 00, JOINT SEALANTS.
- I. Aluminum and glass hinged entry doors and storefront construction: Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- J. Blast resistance: Section 08 56 53, BLAST RESISTANT FAÇADE SYSTEMS.
- K. Glazing: Section 08 80 00, GLAZING.
- L. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- M. Seismic bracing: Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS.

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1.3 QUALITY ASSURANCE**A. Qualifications:**

1. Approval is required of products or service of proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
 - a. Manufacturers Qualifications: Manufacturer with five (5) years continuous documented experience in design, fabrication, and installation of glazed aluminum curtain wall systems of type and size required for that project.
 - b. Blast Engineering Consultant Qualifications: Blast engineering consultants shall be professional engineers who are acceptable to the Contracting Officer and have a minimum of 5 years experience in providing blast engineering services of the kind indicated for projects of similar size and scope.
 - c. Installer: Manufacturer approved in writing. Continuously installed glazed aluminum curtain walls systems for previous five (5) years.
 - d. Manufacturer shall provide technical field representation at project site, as a minimum, at start of project, during middle, towards end of project, and during field testing of field mockup panel.
 - e. Testing Laboratory: Contractor retained. Engage an AAMA accredited commercial testing laboratory to perform tests specified. Submit information regarding testing laboratory's facilities and qualifications of technical personnel to perform testing specified in this section.
 - f. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of glazed aluminum curtain wall system. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, one another, and adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, or in-service performance.
 - 1) Do not modify intended aesthetic effects. If modifications are proposed, submit comprehensive explanatory data for review.
 - g. Qualification of Welders:
 - 1) Welding shall be performed by certified welders qualified in accordance with AWS D1.2, using procedures, materials, and equipment of the type required for this work.

B. Pre-Installation Conference:

1. Prior to starting installation of glazed curtain wall system schedule conference with Contracting Officer to ensure following:
 - a. Clear understanding of drawings and specifications.
 - b. Onsite inspection and acceptance of structural and pertinent structural details relating to curtain wall system.

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- c. Coordination of work of various trades involved in providing system. Conference shall be attended by Contractor; personnel directly responsible for installation of curtain wall system, sun shades, flashing and sheet metal work, firestopping system and curtain wall manufacturer and their Technical Field Representatives. Conflicts shall be resolved and confirmed in writing.

1.4 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Product Data:
 - 1. Manufacturer's standard details and fabrication methods.
 - 2. Data on finishing, components, and accessories.
 - 3. Instructions: Submit descriptive literature, detail specifications, available performance test data and instructions for installation, and adjustments.
 - 4. Recommendations for maintenance and cleaning of exterior surfaces.
- C. Shop Drawings:
 - 1. Show elevations of glazed curtain wall system at 1:50 (1/4 inch) scale, metal gages, details of construction, methods of anchorage, glazing details, and details of installation.
 - 2. Submit for curtain wall system, accessories, and mock-up. Tentative approval of drawings shall be received before fabrication of mock-up. Final approval of drawings shall be deferred pending approval of mock-up and accessories. Drawings shall indicate in detail all system parts including elevations, full size sections, framing, jointing, panels, types and thickness of metal anchorage details, flashing and coping details, field connections, weep and drainage system, finishes, sealing methods, glazing, glass sizes and details. For aluminum exterior sunshades include plans, elevations, sections, blade angles, blade spacing and attachments to compatible systems. Submit cleaning and maintenance instructions. Drawings to indicate calculated design loads at connections to supporting structure.
 - 3. Operation and Maintenance Manuals
 - a. Submit cleaning and maintenance instructions.
- D. Samples:
 - 1. Submit pairs of samples of each specified color and finish on 300 mm (12-inch) long section by width of each tubular, or extruded shape section or 300 mm by 300 mm (12-inch by 12-inch) wide sections of sheet shapes.
 - 2. Submit corner section of framing members showing fasteners, panels, glazing methods, glazing materials, and weather-stripping. Submit one sample minimum 300 mm by 300 mm (12 inches by 12 inches). In lieu of submitting separate samples for corner section, intermediate section,

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and panel, one composite sample incorporating all components and features listed may be submitted.

3. Build mockups for type(s) of sunshade elevation(s) indicated, in location(s) shown on Drawings
4. Where normal color variations are anticipated, include 2 or more units in set indicating extreme limits of color variations.

E. Glass:

1. Specified in Section 08 80 00, GLAZING.

F. Quality Control Submittals:

1. Design Data:

- a. Submit structural and thermal calculations for complete wall assembly. Structural calculations and design shop drawings shall be signed and sealed by a structural engineer registered the State of California.

2. Factory Test Reports:

- a. Test Reports: Provide certified test reports, for each of following listed tests, from a qualified independent testing laboratory showing that glazed aluminum curtain wall system assembly has been tested in accordance with specified test procedures and complies with performance characteristics as indicated by manufacturer's testing procedures. Manufacturer shall submit appropriate testing numbers for specific tests indicated below.
 - 1) Deflection and structural tests.
 - 2) Water penetration tests.
 - 3) Air infiltration tests.
 - 4) Delamination tests.
 - 5) Thermal conductance tests.
 - 6) Sound transmission loss test.
 - 7) Submit factory tests required except that where a curtain wall system or component of similar type, size, and design as specified for this project has been previously tested within last year, under conditions specified herein, resulting test reports may be submitted in lieu of listed testing.

G. Manufacturer's Certificates:

1. Submit Certificates of Compliance, with specification requirements, for the following:
 - a. Metal extrusions.
 - b. Metal accessories.
 - c. Stating that aluminum has been given specified thickness of anodizing or organic coating finish.
 - d. Indicating manufacturer's and installer's meet qualifications as specified.
 - e. Submit list of equivalent size installations, for both

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manufacturer and installer, which have had satisfactory and efficient operation.

H. Blast Mitigation Reports:

1. Submit blast mitigation reports that include a summary narrative, structural design sketches, and structural design calculations, for the work required to resist blast loads for the window wall and curtainwall systems, showing compliance with blast performance requirements. Blast reports shall be prepared and submitted by qualified blast engineering consultants who are experienced in blast resistant design of these systems. Refer to SECTION 08 56 53 for additional requirements.
2. Report shall show all forces imposed on building structure and confirm capacity of design of structure to accommodate imposed loading.

I. Manufacturer's Field Reports:

1. Submit field reports of manufacturer's field representative observations of curtain wall installation indicating observations made during inspection at beginning of project, during middle of installation and at conclusion of project. Indicate results of field testing of mockup field panel, and any directions given Contractor for corrective action.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Refer to AAMA CW 10 for care and handling of architectural aluminum from shop to site.
- B. Prior to packaging for shipment from factory, mark wall components to correspond with shop and erection drawings and their placement location and erection.
- C. Prior to shipment from factory, place knocked-down lineal members in cardboard containers and cover finished surfaces of members with protective covering of adhesive paper, waterproof tape, or strippable plastic. Do not cover metal surfaces that will be in contact with sealants after installation.
- D. Inspect materials delivered to site for damage; unload and store with ventilation, free from heavy dust, not subject to combustion products or sources of water, and shall permit easy access for inspection and handling. Sealing and caulking compounds, including handling, shall be in accordance with requirements of Section 07 92 00 JOINT SEALANTS.
- E. Storage and Protection: Store materials protected from exposure to harmful weather conditions. Handle sunshade materials and components to avoid damage. Protect sunshade materials against damage from elements, construction activities, and other hazards before, during and after installation.

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1.6 PROJECT CONDITIONS

- A. Field Measurements: Where glazed aluminum curtain wall systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying Work.

1.7 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
1. MCWM-1-89 Metal Curtain Wall Manual
 2. CW 10-04 Care and Handling of Architectural Aluminum from Shop to Site
 3. CW 11-85 Design Windloads for Buildings and Boundary Layer Wind Tunnel Testing
 4. CW 13-85 Structural Sealant Glazing Systems (A Design Guide)
 5. CWG 1-89 Installation of Aluminum Curtain Walls
 6. TIR A1-04 Sound Control for Aluminum Curtain Walls and Windows
 7. TIR A8-08 Structural Performance of Poured and Debridged Framing Systems
 8. TIR A9-91 Metal Curtain Wall Fasteners
 9. TIR A11-04 Maximum Allowable Deflection of Framing Systems for Building Cladding Components of Design Wind Loads
 10. 101-I.S.2/A440-08 Windows, Doors and Unit Skylights
 11. 501-05 Methods of Test for Exterior Walls
 12. 503-08 Field Testing of Metal Storefronts, Curtain walls and Sloped Glazing Systems
 13. 2605-98 High Performance Organic Coatings on Architectural Extrusions and Panels
 14. 1503-09 Thermal Transmission and Condensation Resistance of Windows, Doors and Glazed Wall Sections
- C. American National Standards Institute (ANSI):
1. Z97.1-04 Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test
- D. American Society of Civil Engineers (ASCE):
1. ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
- E. American Society for Testing and Materials (ASTM):

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1. A36/A36M-08 Structural Steel
2. A123-09 Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
3. A193-10 Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service
4. A307-10 Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
5. B209-10 Aluminum and Aluminum Alloy Sheet and Plate
6. B211-03 Aluminum and Aluminum Alloy Bar, Rod, Wire
7. B221/B221M-08 Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
8. B316/B316M-10 Aluminum and Aluminum Alloy Rivet and Cold-Heading, Wire, and Rods
9. C578-10 Rigid Cellular Polystyrene Thermal Insulation
10. C612-10 Mineral Fiber Block and Board Thermal Insulation
11. C920-11 Elastomeric Joint Sealants
12. C794-10 Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants.
13. C1363-05 Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus
14. D1037-06 Evaluating the Properties of Wood-Base Fibers and Particle Panel Materials
15. E84-10 Surface Burning Characteristics of Building Materials
16. E90-09 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
17. E283-04 Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Difference Across this Specification
18. E330-02(R2010) Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
19. E331-00(R2009) Water Penetration of Exterior Windows, Curtain Walls, and Doors By Uniform Static Air Pressure Difference
20. E413-10 Classification for Rating Sound Insulation
21. E783-02(R2010) Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
22. E1105-00(R2008) Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors By Uniform or Cyclic Static Air Pressure Differences

F. American Welding Society, Inc. (AWS):

1. D1.2-08 Structural Welding Code-Aluminum

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- G. Consumer Product Safety Commission (CPSC):
 - 1. 16 CFR 1201 Architectural Glazing Standards and Related Material
- H. Federal Specifications (FS):
 - 1. TT-P-645B-90 Primer, Paint, Zinc-Molybdate, Alkyd Type
- I. Glass Association of North America (GANA):
 - 1. 2010 Edition GANA Glazing Manual
 - 2. 2008 Edition GANA Sealant Manual
 - 3. 2009 Edition GANA Laminated Glazing Reference Manual
 - 4. 2008 Edition Tempered Glass Engineering Standard Manual
- J. Military Specifications (MIL):
 - 1. MIL-C-18480 (Rev. B) Coating Compound, Bituminous Solvent, Coal Tar Base
- K. National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. 500 Series (2006) Metal Finishes Manual.
- L. Steel Structures Painting Council (SSPC)
 - 1. Paint 25-97 (2004) Red Iron Oxide Raw Linseed Oil and Alkyd Primer (Without Lead and Chromate Pigments)

1.8 WARRANTY

- A. Submit manufacturer's written warranty for materials, installation and weathertightness, and subject to terms of "Warranty of Construction", FAR clause 52.246-21, except that warranty period shall be extended to five (5) years from date of final acceptance of project by Government.

PART 2 - PRODUCTS**2.1 SYSTEM DESCRIPTION**

- A. Design Requirements:
 - 1. Curtain Wall System: Tubular aluminum sections Tubular aluminum sections self supporting framing, factory prefinished, vision glass, glass, sunshades; related flashings, anchorage and attachment devices to structure.
 - 2. System Assembly: Site assembled or shop unitized assembly.
 - 3. No curtain wall framing member shall deflect, in a direction normal to plane of; more than 1/175 of its clear span or 20 mm (3/4 inch), whichever is less, when designed in accordance with requirements of TIR A11 and tested in accordance with ASTM E330, except that when a gypsum wallboard surface will be affected, deflection shall not exceed 1/360 of span. No framing member shall have a permanent deformation in excess of 0.2 percent of its clear span when tested in accordance

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with ASTM E330 for a minimum test period of 10 seconds at 1.5 times design wind pressures indicated as part of structural drawing wind load requirements. No glass breakage, damage to fasteners, hardware or accessories shall be permitted due to deformation stated above:

- a. Provide system complete with framing, mullions, trim, fasteners, anchors, accessories, concealed auxiliary members, and attachment devices for securing wall to structure as specified or indicated. Unless noted otherwise, comply with MCWM-1.
- b. Curtain wall system components and integral door and/or window units or sun shades shall be furnished by one manufacturer or fabricator; however, all components need not be products of same manufacturer.
- c. Fully coordinate system accessories directly incorporated including sunshades, and adjacent to contiguous related work and insure materials compatibility, deflection limitations, thermal movements, and clearances and tolerances as indicated or specified.
- d. Provide system with adequate allowances for expansion and contraction of components and fastenings to prevent buckling damage, joint seal failure, glass breakage, undue stress on fastenings or other detrimental effects. For design purposes, base provisions for thermal movement on assumed ambient temperature range of from -18 degrees C to 49 degrees C (0 degrees F to 120 degrees F).
- e. Provide wall system to accommodate tolerances in building frame and other contiguous work as indicated or specified.

B. Manufacturer's Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of curtain walls that are similar to those indicated for this Project in material, design, and extent.

C. Performance Requirements:

1. System shall meet or exceed all performance requirements specified.
2. Curtain wall components shall have been tested in accordance with requirements below and shall meet performance requirements specified:
3. System Design: Design and size components to withstand dead loads and live loads caused by positive and negative wind loads acting normal to plane of wall as calculated in accordance with ASCE 7-Minimum Design Loads for Buildings and Other Structures.
 - a. Basic Wind Speed: 115 mph (51 m/s).
 - b. Importance Factor: 1.15.
 - c. Exposure Category: B.
 - d. Occupancy Category: IV
4. Seismic Loads: Design and size components to withstand seismic loads and sway displacement as calculated in accordance with ASCE 7 and VA Seismic Design Requirements (H-18-8).
5. Blast Hazard Mitigation Design Criteria and Structural Performance:

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- a. Refer to SECTION 08 56 53 for blast requirements.
- 6. Water Penetration:
 - a. No water penetration shall occur when wall is tested in accordance with ASTM E331 at a differential static test pressure of 20 percent of inward acting design wind pressure as indicated on structural drawings, but not less than 479 Pa (10 psf).
 - b. Make provision in wall construction for adequate drainage to outside of water leakage or condensation that occurs within outer face of wall. Leave drainage and weep openings in members and wall open during test.
- 7. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783
 - a. Static-Air-Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
 - b. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq ft) of surface maximum.
- 8. Deflections Test: ASTM E330, Procedure B:
 - a. No member shall deflect in a direction parallel to plane of wall, when carrying its full design load, more than an amount which will reduce edge cover or glass bite below 75 percent of design dimension. No member after deflection under full design load, shall have a clearance between itself and top of panel, glass, sash, or other part immediately below it less than 3 mm (1/8 inch); clearance between member and an operable window or door shall be minimum 1.5 mm (1/16 inch).
- 9. Sound Attenuation Through Wall System (Exterior to Interior):
 - a. STC **50**, measured in accordance with ASTM E413.

2.2 MATERIALS

- A. Extruded Aluminum Framing Members: ASTM B221M; 6063-T5 extruded aluminum for non-structural components or 6063-T6 extruded aluminum for structural members; temper and alloy as recommended by manufacturer.
- B. Sheet Aluminum: ASTM B209M; 6065-T5 temper and alloy as recommended by manufacturer.
 - 1. Formed flashing and closures: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
 - 2. Extruded sill members: Minimum 1.58 mm (0.062 inch) thick aluminum, in finish as selected.
- C. Steel Sections: ASTM A36M.
- D. Primer: TS TT-P-645; red, for shop application and field touch-up.
- E. Fasteners:
 - 1. For Exterior Cap Retainers: ASTM A193 B8 300 series, stainless steel screws.
 - 2. For Framework Connections: ASTM B211M 2024-T4 aluminum, ASTM A193 B8300 series, stainless steel, and ASTM B316 aluminum rivets, as

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required by connection.

3. For Anchoring Glazed Aluminum Curtain Wall to Support Structure: ASTM A307 zinc plated steel fasteners.

F. Shims: Metal or plastic.

G. Joint Sealants and Accessories:

1. In accordance with requirements specified in Section 07 92 00, JOINT SEALANTS.
2. Structural Flush Glazed Joints: High performance silicone sealant applied in accordance with manufacturer's recommendations.
3. Non-structural Flush Glazed Joints and Weather Seal Joints: Silicone sealants applied in accordance with manufacturer's recommendations.
4. Structural silicone sealant performance requirements: ASTM C920.
 - a. Hardness: Type A, 30 durometer.
 - b. Ultimate Tensile Strength: 1172 kPa (170 psi).
 - c. Tensile at 150% Elongation: 55 kPa (80 psi).
 - d. Joint Movement Capability after 14 Day Cure: +/- 50%.
 - e. Peel Strength aluminum, after 21 Day Cure: 599 g/mm (34 pounds per inch).
5. Structural silicone shall not be used to support dead weight of vertical glass or panels.
6. Comply with recommendations of sealant manufacturer for specific sealant selections.
7. Provide only sealants that have been tested per ASTM C794 to exhibit adequate adhesion to samples of glass and metal equivalent to those required for project.
8. Exposed metal to metal joints: Silicone sealant selected from manufacturer's standard colors.

H. Glazing Materials:

1. As specified under Section 08 80 00, GLAZING.
2. Glazing Gaskets:
 - a. Exterior: Continuous EPDM gaskets at each glass and spandrel panel.
 - b. Interior: Continuous, closed cell PVC foam sealant tape, sealed at corners.
3. Glass Sizes and Clearances:
 - a. Accommodate up to 1 3/16 inch laminated insulated glazing.
 - b. Sizes indicated are nominal. Verify actual sizes required by measuring frames. Coordinate dimensions for glass and glass holding members to meet applicable minimum clearances as recommended by glass manufacturer. Do not nip glass to remove flares or to reduce oversized dimensions. All cutting shall occur in factory.

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4. Glass Setting Materials:

- a. Provide head bead and drive wedge required for glass installation to suit curtain wall system in accordance with manufacture's recommendations.
- b. If used in psychiatric facilities, the glass shall be retained in the framing system in such a manner that it can withstand lateral forces in excess of force required to break the glass. Plastic clips for holding glass are not permitted.

- I. Firestopping: Refer to Section 07 84 00, FIRESTOPPING for requirements.

2.3 FABRICATION

- A. Curtain wall components shall be of materials and thickness indicated or specified. Details indicated are representative of required design and profiles. Maintain sightlines indicated on drawings. Unless specifically indicated or specified otherwise, methods of fabrication and assembly shall be at discretion of curtain wall manufacturer. Perform fitting and assembling of components in shop to maximum extent practicable. Anchorage devices shall permit adjustment in three directions. There shall be no exposed fasteners.
- B. Joints: Joints exceeding +1.5 mm (+1/16 inch) shall be mechanically fastened.
- C. Ventilation and Drainage: Direct water leakage to exterior by means of concealed drainage system and weeps. Flashings and other materials used internally shall be nonstaining, noncorrosive, and nonbleeding.
- D. Protection and Treatment of Metals:
 1. Remove from metal surfaces lubricants used in fabrication and clean off other extraneous material before leaving shop.
 2. Provide protection against galvanic action wherever dissimilar metals are in contact, except in case of aluminum in permanent contact with galvanized steel, zinc, stainless steel, or relatively small areas of white bronze. Paint contact surfaces with one coat bituminous paint conforming to MIL-C-18480 or apply appropriate caulking material or nonabsorptive, noncorrosive, and nonstaining tape or gasket between contact surfaces.
- E. Metal Sills and Closures: Fabricate accessories, spandrel panels, trim closures of sizes and shapes indicated from similar materials and finish as specified for wall system.
- F. Concealed Interior Mullion Reinforcing: ASTM A36M steel shapes as required for strength and mullion size limitations, hot dip galvanized after fabrication in accordance with ASTM A123.

2.4 PROTECTION

- A. Provide protection for aluminum against galvanic action, wherever dissimilar materials are in contact, by painting contact surfaces of dissimilar material with a heavy coat of bituminous paint (complete

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

2.5 METAL FINISHES

- A. In accordance with NAAMM AMP500 series.
- B. Fluorocarbon Finish: AAMA 2605.
 - 1. Color as selected.
- C. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.
 - .
- D. Touch-Up Primer for galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
 - .
- E. Concealed Steel Items: Galvanized in accordance with ASTM A123 to 610 gm/sq m (2.0 oz/sq ft).
- F. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Prior to installation of glazed curtain wall system, arrange for representative(s) of manufacturer to examine structure and substrate to determine that they are properly prepared, and ready to receive glazed curtain wall work included herein.
- B. Verifying Conditions and Adjacent Surfaces: After establishment of lines and grades and prior to system installation examine supporting structural elements. Verify governing dimensions, including floor elevations, floor to floor heights, minimum clearances between curtain wall and structural frames, and other permissible dimensional tolerances in building frame.

3.2 PREPARATION

- A. Take field dimensions and examine condition of substrates, supports, and other conditions under which work of this section is to be performed to verify that work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Contact between aluminum and dissimilar metals shall receive a protective coating of asphaltic paint for prevention of electrolytic action and corrosion.

3.3 INSTALLATION

- A. Installation and erection of glazed curtain wall system and all components

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shall be in accordance with written directions of curtain wall manufacturer. Match profiles, sizes, and spacing indicated on approved shop drawings.

- B. Bench Marks and Reference Points: Establish and permanently mark bench marks for elevations and building line offsets for alignment at convenient points on each floor level. Should any error or discrepancy be discovered in location of marks, stop erection work in that area until discrepancies have been corrected.
- C. Ensure that drainage system operates properly in accord with AAMA 501 procedures.
- D. Do not proceed with structural silicone work when metal temperature is below 0 degrees C (32 degrees F).
- E. Isolate between aluminum and dissimilar metals with protective coating or plastic strip to prevent electrolytic corrosion.
- F. Install glazed aluminum curtain wall system so as to maintain a virtually flat face cap, with no visible bowing.
- G. Install entire system so that fasteners are not visible.
- H. Tolerances:
 - 1. Maximum variation from plane or location shown on approved shop drawings: 3 mm per 3600 mm (1/8 inch per 12 feet) of length up to not more than 13 mm (1/2 inch) in any total length.
 - 2. Maximum offset from true alignment between two identical members abutting end to end in line: 0.8 mm (1/32 inch).
 - 3. Sealant Space Between Curtain Wall Mullion and Adjacent Construction: Maximum of 19 mm (3/4 inch) and minimum of 6 mm (1/4 inch).
- I. Joint Sealants:
 - 1. Joint Sealants: Shall be in accordance with requirements of Section 07 92 00, JOINT SEALANTS.
 - 2. Surfaces to be primed and sealed shall be clean, dry to touch, free from frost, moisture, grease, oil, wax, lacquer, paint, or other foreign matter. Enclose joints on three sides. Clean out grooves to proper depth. Joint dimensions shall conform to approved detail drawings with a tolerance of plus 3 mm (1/8 inch). Do not apply compound unless ambient temperature is between 5 and 35 degrees C (40 and 90 degrees F). Clean out loose particles and mortar just before sealing. Remove protective coatings or coverings from surfaces in contact with sealants before applying sealants or tapes. Solvents used to remove coatings shall be of type that leave no residue on metals.
 - 3. Match approved sample. Force compound into grooves with sufficient pressure to fill grooves solidly. Sealing compound shall be uniformly smooth and free of wrinkles and, unless indicated otherwise, shall be tooled and left sufficiently convex to result in a flush joint when dry. Do not trim edges of sealing material after joints are tooled.

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Mix only amount of multi-component sealant which can be installed within four hours, but at no time shall this amount exceed 19 liters (5 gallons).

4. Apply primer to masonry, concrete, wood, and other surfaces as recommended by sealant manufacturer. Do not apply primer to surfaces which will be exposed after caulking is completed.
5. Tightly pack backing in bottom of joints which are over 13 mm (1/2 inch) in depth with specified backing material to depth indicated or specified. Roll backing material of hose or rod stock into joints to prevent lengthwise stretching.
6. Install bond preventive material at back or bottom of joint cavities in which no backstop material is required, covering full width and length of joint cavities.
7. Remove compound smears from surfaces of materials adjacent to sealed joints as work progresses. Use masking tape on each side of joint where texture of adjacent material will be difficult to clean. Remove masking tape immediately after filling joint. Scrape off fresh compound from adjacent surfaces immediately and rub clean with approved solvent. Upon completion of caulking and sealing, remove remaining smears, stains, and other soiling, and leave work in clean neat condition.

J. Glass:

1. Refer to Section 08 80 00, GLAZING, and drawing for glass types. Install in accordance with manufacturer's recommendations as modified herein.
2. Before installing glass, inspect sash and frames to receive glass for defects such as dimensional variations, glass clearances, open joints, or other conditions that will prevent satisfactory glass installation. Do not proceed with installation until defects have been corrected.
3. Clean sealing surfaces at perimeter of glass and sealing surfaces of rebates and stop beads before applying glazing compound, sealing compound, glazing tape, or gaskets. Use only approved solvents and cleaning agents recommended by compound or gasket manufacturer. All sashes shall be designed for outside glazing. Provide continuous snap in glazing beads to suit glass as specified.
4. Insulating and tempered glass, and glass of other types that exceed 100 united inches in size: Provide void space at head and jamb to allow glass to expand or move without exuding sealant. Perimeter frames and ventilator sections shall have glazing rebates providing an unobstructed glazing surface 19 mm (3/4 inch) in height. Glazing rebate surfaces must be sloped to shed water.
5. Provide adequate means to weep incidental water and condensation away from sealed edges of insulated glass units and out of wall system. Weeping of lock-strip gaskets should be in accordance with recommendation of glass manufacturer.

K. Metal Copings:

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1. Refer to Section 07 60 00, FLASHING AND SHEET METAL for requirements of metal copings when they are not a part of glazed curtain wall system work. Refer also to Section 07 42 43 for Composite Wall Panel parapet system.
2. Coordinate curtain wall installation with metal coping detail on Contract drawings. Provide watertight seal to meet criteria set forth in this section regarding air and water penetration.

3.4 ADJUSTING

- A. Adjust doors to provide a tight fit at contact points and operate easily.
- B. Adjust weather-stripping to make even contact with surfaces.
- C. Adjust operating hardware and moving parts.

3.5 CLEANING

- A. Install curtain wall frame and associated metal to avoid soiling or smudging finish.
- B. Clean metal surfaces promptly after installation, exercising care to avoid damage to coatings.
- C. Remove excess glazing and sealant compounds, dirt, and other substances.
- D. Follow recommendations of manufacturer in selection of cleaning agents. Do not use cleaning agents containing ammonia or other compounds that might damage finished metal surfaces.
- E. Replace cracked, broken, and defective glass with new glass at no additional cost to Government. Just prior to final acceptance of curtain wall system clean glass surfaces on both sides, remove labels, paint spots, compounds, and other defacements, and clean metal fixed panels. Remove and replace components that cannot be cleaned successfully.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage an AAMA accredited commercial qualified independent testing and inspecting agency to perform field quality-control tests specified, and to prepare test reports: Submit information regarding testing laboratory's facilities and qualifications of technical personnel to Contracting Officer for approval.
- B. Conduct field check test for water leakage on designated wall areas after erection to comply with MCWM-1. Conduct test on two wall areas, two bays wide by two stories high where directed. Conduct test and take necessary remedial action as directed by Contracting Officer.
- C. Test Specimen:
 1. Test specimen shall include curtain wall assembly and construction. Test chamber shall be affixed to exterior side of test specimen and test shall be conducted using positive static air pressure.

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2. Test specimens shall be selected by Contracting Officer after curtain wall system has been installed in accordance with Contract drawings and specification.
- D. Sealant Adhesion Tests: Test installed sealant, in presence of sealant manufacturer's field representative, in a minimum of two areas and as follows:
1. Test structural silicone sealant according to field adhesion test method described in AAMA CW 13, "Structural Sealant Glazing Systems (A Design Guide)."
 2. Test weatherseal sealant as recommended in writing by sealant manufacturer.
- E. Air Infiltration: Test glazed aluminum curtain wall system according to AAMA 503, which requires testing according to ASTM E783.
1. Field air leakage testing is not required for continuous curtain wall systems.
 2. Static-Air-Pressure Differential: 75 Pa (1.57 lbf/sq. ft.) minimum.
 3. Air Leakage: 0.03 L/s per sq. m (0.06 cfm/sq. ft.) of surface maximum.
- F. Water Penetration: Test glazed aluminum curtain wall system for compliance with requirements according to AAMA 503, which requires testing according to ASTM E1105.
1. Uniform Static-Air-Pressure Difference: 20 percent of positive design wind load, but not less than 479 Pa (10 psf). No uncontrolled water shall be present.
- G. Retesting:
1. Should system fail field test, system may be modified or repaired, and retested.
 2. Should system fail second field test, system may be additionally modified or repaired, and retested.
 3. All modifications and repairs made to tested areas shall be recorded, and same modifications and repairs made to all system and adjacent construction on project.
 4. Should second test fail, Contracting Officer may require testing of additional areas of the curtain wall.
- H. Rejection:
1. Failure of any of specimens to meet test requirements of third test shall be cause for rejection of wall system and adjacent construction on project.

3.7 PROTECTION

- A. After installation, protect windows, and other exposed surfaces from disfiguration, contamination, contact with harmful materials, and from other construction hazards that will interfere with their operation, or damage their appearance or finish. Protection methods shall be in

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accordance with recommendations of product manufacturers or of respective trade association. Remove paper or tape factory applied protection immediately after installation. Clean surfaces of mortar, plaster, paint, smears of sealants, and other foreign matter to present neat appearance and prevent fouling of operation. In addition, wash with a stiff fiber brush, soap and water, and thoroughly rinse. Where surfaces become stained or discolored, clean or restore finish in accordance with recommendations of product manufacturer or respective trade association.

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 08 56 53**BLAST RESISTANT FAÇADE SYSTEMS****PART 1 - GENERAL****1.1 DESCRIPTION:**

- A. The extent of exterior metal window units required to provide specified resistances is indicated on Contract Drawings by elevations/details/ schedules/notations.

1.2 RELATED WORK:

- A. Cold-Formed Metal Framing: Section 05 40 00
- B. Glazed Aluminum Curtain Walls: Section 08 44 13
- C. Aluminum Windows: Section 08 51 13
- D. Glazing: Section 08 80 00

1.3 SYSTEM PERFORMANCE:

- A. Fabricate and install blast resistant façade wall systems including but not limited to punched window, store front, curtain wall, door, louver, and metal panel wall systems to achieve indicated levels of resistance. Extend resistance to include anchorages, interfaces with adjoining substrates, glass retention, and hardware.
- B. In conjunction with meeting aesthetic and performance requirements, the Contractor may propose alternate design methods for consideration.
- C. General: Design exterior window and façade wall systems, and interior window systems at the vestibule to meet the performance requirements for a 'Mission Critical' facility at a minimum dynamic design pressure of 4-psi, considering a 14-msec time duration, in accordance with the Physical Security Design Manual for VA Facilities dated July 2007.
- D. Window System Design: Exterior punched window, storefront, curtain wall glazing systems, and interior window systems at the vestibule shall be designed as follows:
 - 1. Acceptable Glass Response Blast Resistant Window Systems: Glazing shall be laminated and is to meet the equivalent of GSA Performance Condition 3B or better. Condition 3B is defined as glazing breaks, glass fragments enter the space, and land on the floor no further than 10 feet (3 meters) from the window.
 - 2. Acceptable Glass Response for Blast Resistant Skylight Systems: Skylights shall be laminated and are to meet the equivalent of GSA Performance Condition 2 or better. Condition 2 is defined as the glazing cracks but remains in the frame.

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3. Glass Design: Use WinGARD 5.5.1 or latest to design exterior glass panes to resist ramp-down dynamic air-blast loads corresponding to a peak pressure of 4-psi that linearly decays over a 14-msec time duration. The glazing shall have sufficient bite or structural silicone adhesive to allow it to develop its glazing capacity.
4. Supporting Structure Design: Design frame members and mullions to the applied blast load over the appropriate effective area of the frame or mullion.
 - a. Ductility (μ): Provide a maximum ductility value for the flexural response of $\mu \leq 3$ for steel or aluminum.
 - b. Support Rotation (θ): Provide a maximum rotation value for the flexural response as follows:
 - i. $\theta \leq 3.8$ degrees for structural steel
 - ii. $\theta \leq 3$ degrees for aluminum
 - c. Analysis must show that glazing will not disengage from the window framing system when mullion rotations exceed 2° or provide a minimum 1/4-in. of structural silicone sealant in accordance with this specification.
5. Connection Design:
 - a. Design connections to the lesser of the following:
 - i. The dynamic peak edge shear glazing reaction over the perimeter length of the frame, or
 - ii. Sum all mullion reaction forces framing into a connection joint based on each element's flexural yield capacity.
 - b. Connection Safety Factors (SF):
 - i. $SF = 1$ shall be allowed for connection elements that provide a ductile mode of failure (e.g. bolt bearing, tensile yielding, etc.)
 - ii. $SF = 1.5$ shall be used for connection elements that provide a non-ductile mode of failure (e.g. weld fracture, concrete cone failure due to anchor bolt pull-out, etc.)
 - iii. Connection assembly may be designed for the lesser of a $SF = 1.5$ or the strength of the actual failure mechanism in the assembly, provided it is governed by a ductile mode.
6. Spandrel Panel Design: Analysis shall be performed to determine the response of spandrel glass, panels and/or the back-up wall system. Performance should focus on the limitation of flying debris into occupied space.
 - a. Glass: Laminated meeting a Performance Condition Level 3B or better. Glass panes located more than 10 ft above floor shall meet a Performance Condition Level 2.
 - b. Metal Panel: Metal panels backing up the spandrel glass are to be designed for:
 - i. Deformation: $L/30$

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- ii. Connections: Develop capacity of the metal panels
 - 7. Exterior Appendage Design: Exterior appendages to the window system (i.e. Sun and Wind Screens) shall be connected to their supporting elements with connections able to develop the component's plastic flexural capacity (using plastic section modulus, Z)
 - 8. Operable windows shall open outwards and respond to air-blast loading by closing shut without causing incipient failure of glazing. Windows shall be continuously supported by a mechanical stop around the perimeter with a capacity to force failure of the glass pane.
 - 9. For replacement windows where noted on drawings, design the window systems in accordance with requirements in this Section 1.3.C and 1.3.D.
 - 10. For existing windows to remain as noted on drawings, a mechanically anchored or wet glazed anti-shatter film shall be used to meet the requirements indicated in Section 1.3.C and 1.3.D. Anchorage of the upgraded system shall be validated and designed in accordance with Section 1.3.D.5.
- E. Exterior Doors and Entry Vestibule Interior Door Design:
- 1. Exterior doors and entry vestibule interior door shall be designed such that they seat within a continuous door stop, which is mechanically attached to a door frame. Doors may fail outward in response to blast loading, and hardware (i.e. hinges and locks) may fail. Mullions and structure serving to support doors shall be designed for blast loading specified in section 1.3.C applied over the effective width of the element and tributary width of the door opening. Framing supporting the door opening shall also meet the requirements of 1.3.D.4 and 1.3.D.5, and 1.3.F for mullion and light-gage framing support, where occurs.
 - 2. Exterior door and entry vestibule interior door glazing shall be laminated and glazing shall meet the performance requirements as indicated in Section 1.3.D.1 and 1.3.D.2.
- F. Light-Gage Framing Design: Light-gage framing supporting exterior façade wall, glazing systems, and doors shall be dynamically designed as follows:
- 1. Ductility (μ): Provide a maximum ductility value for the flexural response of $\mu \leq 2$.
 - 2. Support Rotation (θ): Provide a maximum support rotation value for the flexural response of $\theta \leq 3.8$ degrees.
 - 3. Connection: Design connections to develop the plastic flexural capacity of the element.
 - 4. Built-up sections shall be fastened at regular intervals along the length such that the plastic flexural capacity of the composite section can be developed without instability.

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- G. Metal Panel Wall: Insulated metal panels, corrugated deck, and metal sheathing at exterior face of façade wall systems shall be dynamically designed for the dynamic loading of Section 1.3.C as follows:
 - 1. Deformation: L/30
 - 2. Connection: Develop plastic flexural capacity of the panel
- H. Louver Design: Exterior louvers at mechanical penthouse air-intakes and exhausts shall be dynamically designed to minimize the blast over-pressure admitted into critical spaces.
 - 1. Design louver elements to the applied blast load applied over the appropriate effective area of the louver.
 - 2. Performance Requirements: Louver elements shall be designed for:
 - a. Deformation: L/30
 - b. Connection: Develop plastic flexural capacity of the louver fins or mullions

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Section 01 33 23, SHOP DRAWINGS.
 - 1. Shop drawings showing dimensioned details of metal window units. Show application of intended glazing materials. Show typical window unit interior and exterior elevations at not less than 3/4"=1'-0" (1:20) scale. Indicate how window units, not necessarily including basic sub-frames, are to be subsequently removed/replaced; and how glazing unit removal/replacement is to be accomplished. After final modifications and corrections have been incorporated, submit drawings as AutoCAD files with .DWG extension:
 - a. Details: Show sections at 3"=1'-0" (1:5) scale of members indicating construction, size, and thickness of components, together with connections, fastenings, and means of separating dissimilar metals.
- B. Calculations: Provide calculations prepared by qualified blast consultant verifying that façade elements meet specific blast resistance requirements detailed in this Section.
 - 1. Prior to performing engineering calculations intended to address the blast loading identified, submit a description of the technique(s) that will be employed to calculate the response of the system to the defined dynamic loading.
 - 2. Calculation package is to include a summary sheet briefly outlining the following:
 - a. Evaluation criteria
 - b. Calculation assumptions
 - c. Table of results by window type/location
 - d. Statement of Conformance with specification requirements.

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- e. Blast calculations are to be submitted at the same time as the related shop drawings
- 3. Calculation submittal is to be stamped and signed by a registered Professional Engineer whose qualifications meet or exceed Quality Assurance criteria.
- 4. Submit single degree of freedom (or better) dynamic analysis for façade window and wall systems. Submit engineering calculations to show that element response meets specified performance requirements under design load. Additionally, illustrate that brittle modes of failure (such as shear and buckling) are avoided. These calculations must include, but may not be limited to, analysis of the following:
 - a. Glass: Determine glass pane performance using an analysis program such as WinGard (Version 5.5.1 or later), developed by the General Service Administration. If a program other than WinGard is used, it must be approved by the Owner prior to calculations. WinGard calculations provided in the calculation package are to include the complete text rather than the "concise" text printout.
 - b. Window System Mullions and Framing Members: A clear load path from the glass shall be provided. Supporting analysis that illustrates each component's response to design loading shall be provided. Analysis shall consider both flexural and shear responses. Analysis shall verify the element's ability to develop its plastic flexural capacity without instability. Calculations must include, but may not be limited to, analysis of the following
 - i. Global Performance: Analysis shall verify that the plastic moment of the mullion, acting in a composite manner with its individual components, can be attained under maximum calculated deflections. Fasteners between each component shall be designed for the plastic capacity of the mullion.
 - ii. Lateral Torsional Buckling: Analysis shall verify the ability of the mullion to provide adequate resistance against lateral torsional buckling under maximum calculated deflections.
 - iii. Local Buckling: Analysis shall verify the ability of the mullion and its individual components and connections to provide adequate resistance against localized buckling along the entire load path under maximum calculated deflections.
 - iv. Structural Silicone Stress: Analysis shall verify the capacity of the silicone to retain the glass under maximum calculated deflections.
 - c. Cold-Formed Framing Members: A clear load path shall be provided. Supporting analysis that illustrates the response to design loading shall be provided. Analysis shall consider both flexural and shear responses. Analysis shall verify the element's ability to develop its plastic flexural capacity without instability. Calculations must include, but may not be limited to, analysis of the following

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- i. Global Performance: Analysis shall verify that the plastic moment of the element can be attained under maximum calculated deflections.
 - ii. Lateral Torsional Buckling: Analysis shall verify the ability of the element to provide adequate resistance against lateral torsional buckling under maximum calculated deflections.
 - iii. Local Buckling: Analysis shall verify the ability of the element to provide adequate resistance against localized buckling along the entire load path under maximum calculated deflections.
 - iv. Web Crippling: Analysis shall verify the ability of the element to provide adequate resistance against web crippling at the element supports.
- d. Anchorage: Analyze the strength of embedded anchor assembly, as well as pull-out and reaction forces shared with the building structure. Analyze the wall anchor clip inserts and fasteners and assemblies, including bolts and stiffeners. Include exact loadings to be transferred to the building structure in the analysis.
 - e. Mechanical Anchors: Mechanical anchor capacities shall be developed from dynamic testing. An International Code Council (ICC-ES) evaluation report showing testing for dynamic loading (i.e. seismic or blast) is to be submitted with calculations.
 - f. Supporting Structure: Coordination of the window/supporting structure interaction shall be the contractors' responsibility. The window contractor's engineer performing blast calculations for the window system shall coordinate loading scenarios with the cladding contractor's engineer providing design for the exterior cladding system. Forces transmitted from the appropriate window tributary area shall be the design loads from the glazing area.

C. Testing Requirements:

- 1. Testing of façade systems shall include the entire window or wall system, including connections, and shall include but not be limited to the following:
 - a. A minimum of three (3) identical specimens should be tested for the design blast load summarized herein or higher. Those specimens should be similar to the configuration indicated in the project documents with respect to geometry (within 10%), material properties, connections, etc.
 - b. Test charge construction and the standoff distance from the center of the charge to the exterior face of the test specimen(s) shall be measured and documented for tests using explosives.
 - c. Blast source construction (compressed gas and/or explosives) shall be measured and documented for shock tube tests.
 - d. A minimum of two (2) pressure transducers shall be used on each test reaction structure to measure the pressure-time

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waveform acting on the exterior face of tested specimens. A minimum of one (1) interior pressure transducer shall be used in each test structure.

2. Where façade window system performance is demonstrated through testing, testing methods shall be in accordance with ASTM F 1642-96.
 3. Test Reports: Evidence of testing in accordance with ASTM F 1642-F methods for dynamic testing shall be submitted in the form of a test report from an independent testing agency. The test report package shall include, but not be limited to, the following:
 - a. Brief description of the test performed and the test apparatus
 - b. Table of comparison between test specimens windows and project configuration
 - c. Table of test results by system type/location
 - d. Summary of recorded air-blast pressure-time history from each pressure transducer
 4. Testing shall be performed by an independent testing agency whose personnel meet or exceed Quality Assurance criteria.
- D. Certificates: Engineer's qualifications that meet or exceed Quality Assurance criteria. At a minimum, qualifications must list each project in which the Engineer performed analysis of window systems, the effective start and end dates of performance of the analysis, and a reference.

1.5 QUALITY ASSURANCE

- A. Provide products that meet the requirements of Physical Security Design Manual (PSDM) July 2007, for Veteran Affairs Life Safety Facilities, Final Draft.
- B. Engineer: Engage an Engineering Professional to perform dynamic analysis of the Blast Resistant Windows. The Engineer shall have a minimum of 5 years experience performing dynamic analysis for blast resistant design and demonstrable experience designing blast resistant window systems in the past 18 months.
- C. Glazing Bite: The required window system bite must be verified in the field.
- D. Installation Orientation: Windows delivered to the construction site are to be clearly labeled as to the proper installation orientation (i.e. laminated pane of glass to be installed as the interior pane.)

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Manufacturer's directions and as required to prevent edge damage or other damage to assembly resulting from effects of moisture, condensation, temperature changes, direct exposure to sun, and contact with chemical solvents.

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- B. Deliver prefabricated units to Project as completely assembled units, ready for anchorage into supporting structure, and for interfacing with other work.

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):
 - ASTM A36/A36M-05..... Standard Specification for Carbon Structural Steel
 - ASTM A123/A123M-02..... Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - ASTM B221-06..... Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- C. National Association of Architectural Metal Manufacturers (NAAMM)
 - AMP 500-505-88..... Metal Finishes Manual
- D. Physical Security Design Manual (PSDM) July 2007, for Veteran Affairs Life Safety Facilities, Final Draft.
- E. WinGARD Version 5.5.1 or latest

PART 2 - PRODUCTS

2.1 MANUFACTURER/FABRICATOR

- A. Certified Units: Provide units and sub-frames which are manufactured/fabricated by firms which have produced identical units required for this Project and which have been certified to comply with requirements for levels of resistance to attack specified.

2.2 MATERIALS

- A. Steel Shapes/Plates/Bars: ASTM A 36, except where another designation is indicated.
- B. Stainless Steel: Provide formed members of AISI Type 304 stainless steel sheet, with No. 4 directional polish.
- C. Bolts and Fasteners: Provide AISI Type 300-series stainless steel screws, bolts, nuts, and washers; comply with ASTM A 320. Provide non-removable type where accessible from attack side.
- D. Aluminum Extrusions/Bars: Provide members complying with ASTM B 221, alloy 6063-T5, -T6, or -T52, or alloy 6061-T6, for principal framing members; provide alloy 6063-T5, -T6, or -T52 for trim and stops which are not exposed to forced entry attack.

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E. Framing Members:

1. Yield Strength: Provide supporting references that grade of steel or aluminum used is capable of achieving calculated ductility ratio.
2. The yield strength of framing members may be increased to account for dynamic strain rate effects as follows:
 - a. Structural Steel: For $f_y = 36$ ksi, the yield strength may be increased by a factor of 1.42. For $f_y = 46$ ksi, the yield strength may be increased by a factor of 1.31.
 - b. Structural Aluminum: The yield strength may be increased by a factor of 1.02.
 - c. Light Gage Metal: The yield strength may be increased by a factor of 1.33.
3. Section Modulus: The plastic section modulus may be used in dynamic design calculations.
4. Built-up Sections: Design built-up sections using ultimate stress and strain compatibility approaches as defined by industry standards. If built-up section is analyzed as one unit, full shear stress transfer along the line of contact between the individual sections must be illustrated.

F. Glazing Materials: Refer to Section 08 80 00.

1. Glass-to-Glass Interlayers: Clear polyvinyl butyrl (PVB) laminating film/sheet shall be used on the inner lite of exterior window systems.
2. Window bite: The minimum allowable bite is $1/2"$ [12.7 mm].
3. Probability of Failure. To determine the response of the glass and the anchorage loads, the probability of breakage for the glass is to be 750 breaks per 1000.

G. Structural Silicone Sealant:

1. Ultimate Tensile Stress: Minimum 200 psi in tension.
2. Safety Factors: ultimate tension and shear capacities are to be used with a safety factor of 1.0.
3. Apply the silicone sealant to the interior perimeter of the glass to bond the glass to the frame. The minimum bead size is $1/4"$ [6 mm].

2.3 FABRICATION

- A. Unit Framing: Shop fabricate unit framing system of section profiles in metal as shown. Provide full-strength, mitered-and-welded corner joints. Provide framing units to achieve specified performances, but not less than metal thicknesses and dimensions shown. Comply with applicable AWS standards for welding, with exposed welds ground reasonably smooth. Provide welded-in-place reinforcements, including anchorage devices as shown. Fabricate metal glazing stops for removal, with mitered corners and countersunk screw attachment to frame.

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- B. Unit Anchorages: Fabricate metal anchorage system/devices as shown, and as required to achieve performance requirements.
- C. Unit Glazing: Install glazing sheets in frames at fabrication plant prior to delivery to project. See section 08 80 00 for laminated glass assemblies.

2.4 FINISHES

- A. General Finishing: Provide the following factory-applied finishes on the fabricated units of metal window framing and sub-framing, including hardware and accessories. Comply with NAAMM Metal Finishes Manual AMP 500-505-88 as applicable:
 - 1. Stainless steel: Finish exposed stainless steel components of the work with AISI No. 4 directional polish, except retain manufacturer's standard mill finish on exposed fasteners and similar devices.
 - 2. Fabricated aluminum: Provide Class I clear anodized coating of 0.018 mm thickness; comply with Aluminum Association designation AA-M12C22A41.
 - 3. Fabricated aluminum: Provide Class I, black, color anodized coating of 0.008 inch (0.018 mm) thickness; comply with Aluminum Association designation AAM12C22A42/A44.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine prepared substrate openings to receive framed fenestration units of this Section. Check anchorages for location and coordination of face plans between walls and fenestration units. Check dimensions and clearances for sealant applications.
- B. Coat substrate surfaces of concrete, masonry, or steel where they will be in contact or close proximity with aluminum or stainless steel framing of fenestration units. Apply 1/32 inch (0.76 mm) coating of bituminous paint, confined to surfaces which will be concealed.

3.2 INSTALLATION

- A. Coordinate installation of window units in sub-frames with installation of expansion joint materials, isolators, joint fillers, spacer strips, tapes, gaskets, sealants, removable sub-frame stops, and other elements as indicated. Tighten bolts for maximum shear and tensile strength, for resisting forces indicated. Comply with Fabricator's instructions and recommendations.
- B. Place installation accessory items as shown and as required for unit installations, including flashings, shims, fillers, bedding materials, and anchorage accessories. Prepare openings for unit interfaces with other work.

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- C. Install window units uniformly to lines and elevations indicated, plumb and level, true to plane of optical reflection. Comply with Fabricator's instructions for final assembly and installation. Install anchor bolts and devices as indicated, exercising care to shim and tighten against substrates without distorting or deflecting frames from intended lines. Provide uniform spaces around units for subsequent installation of joint sealer materials, which are not work of this Section, see Division 7 section for sealants.
- D. Anchorage: The window manufacturer is responsible to provide anchors appropriate for substrate to which window assembly is to be fastened.
- E. Remove protective covering from finished metal surfaces, and from exposed glass and plastic glazing sheets.
- F. Overcoat Painting: Refer to Division 9 section on painting for final overcoating on metal framing and trim members of fenestrations units; not work of this section.

3.3 CLEANING AND PROTECTION

- A. General: Upon completion of installation of metal windows, clean exposed surfaces of window units and sub-frames; comply with Fabricator's instructions. Remove excess and migrating joint sealing compounds, dirt, and foreign substances. Repair damaged areas of factory-applied finishes in accordance with Fabricator's instructions; comply with Project Director's requests. Continue maintenance of exposed finishes through remainder of construction period.
- B. Protection: Provide breakage protection promptly upon completion of fenestration installation. Install crossed streamers of cloth/plastic, adhered to unit framing exterior faces. Maintain through construction completion.
- C. Repair and Replacement: Touch up minor finish damage on metal surfaces where handling and installation have produced marred or abraded areas which can be readily corrected. Replace or refinish units where damage is of greater substance, as directed by Project Director.
- D. Glazing: Clean glazing in accordance with Section 08 80 00, GLAZING.

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SECTION 08 71 00**DOOR HARDWARE****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Door hardware and related items necessary for complete installation and operation of doors.

1.2 RELATED WORK

- A. Caulking: Section 07 92 00 JOINT SEALANTS.
- B. Application of Hardware: Section 08 14 00, 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 Catalog No.	Key Control Symbols	UL Mark (if fire rated and listed)	ANSI/BHMA Finish Designation

- C. Samples and Manufacturers' Literature:

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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

- A. Conform to ANSI A156.15; combination closer-holder with built-in electronic release.
- B. Combination closer-holder shall have the following features:
 - 1. Control door closing and latching sequence by hydraulic action.
 - 2. Wiring for 24V DC current. Current draw shall not exceed 0.16 amperes.
 - 3. Combination closer-holder type:
 - a. At doors with 90-110° hold-open point: Single lever arm with slide track closing action, and adjustable hydraulic back-check. Provide tracks with spring-cushion stop assemblies to avoid the necessity of a separate wall or floor stop. Provide with double egress arm where required.
 - b. At doors with over 110° to 175° hold-open point: Single or double lever arm and adjustable hydraulic back-check. Provide with

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long arms where required for deep frame reveals.

4. Spring power for closing force shall conform to ANSI A156.4 and have 50% spring power adjustment.
5. Hold open mechanism shall hold door open between 85 degrees and 175 degrees depending on wall and frame conditions. Mount device to provide maximum door opening permitted by building construction or equipment.
6. Electronic release shall release door when signaled by smoke detector. Smoke detectors shall not be incorporated as an integral part of door holders. Smoke detectors are specified in the ELECTRICAL Section.
7. All closers to have full covers.
8. All closers shall have a 1 ½" minimum piston diameter and an adjustable back check position valve.

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 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.

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- 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 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

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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. Locks on designated doors in Psychiatric (Mental Health) areas shall be paddle type with arrow projection covers and be UL Listed. Provide these locks with paddle in the down position on both sides of the door. Locks shall be fabricated of wrought stainless steel.
4. Privacy locks in patient rooms shall have an inside thumbturn for privacy and an outside thumbturn for emergency entrance. Single occupancy patient privacy doors shall typically swing out; where such doors cannot swing out, provide center-pivoted doors with rescue hardware (see HW-2B).

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.

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

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quantities as follows:

Locks/Keys	Quantity
Cylinder locks	2 keys each
Cylinder lock change key blanks	100 each different key way
Master-keyed sets	6 keys each
Grand Master sets	6 keys each
Great Grand Master set	5 keys
Control key	2 keys

- B. Psychiatric keys shall be cut so that first two bittings closest to the key shoulder are shallow to provide greater strength at point of greatest torque.

2.14 KEY CABINET

- A. ANSI Standard A156.5. Provide key cabinet made of cold rolled, 1.2 mm (0.0478 inch) thick furniture steel electro-welded. Doors shall have "no sag" continuous brass-pin piano type hinge and be equipped with chrome plated locking door handles, hook cam and mechanical pushbutton door lock. Key Cabinet and Key Control System shall accommodate all keys for this project plus 25 percent. Provide minimum number of multiple cabinets where a single cabinet of largest size will not accommodate the required number of keys.
- B. Key tags shall consist of two sets: Permanent self-locking and loan key snaphook type with tag colors as follows: Red fiber marker of the permanent self-locking type approximately 32 mm (1-1/4 inch) in diameter engraved with the legend "FILE KEY MUST NOT BE LOANED." Also furnish for each hook a white cloverleaf key marker with snap-hooks engraved with the legend "LOAN KEY."
- C. The manufacturer of the lock cylinders and locks shall attach a key tag to keys of each lock cylinder and shall mark thereon the respective item number and key change number. Provide each group of keys in a key gathering envelope (supplied by Key Cabinet Manufacturer) in which the lock manufacturer shall include the following information: Item number, key change number and door number. The contractor shall furnish the Key Cabinet Manufacturer the hardware and keying schedules and change keys.
- D. The Key Cabinet Manufacturer shall set up a three-way cross index system, including master keys, listing the keys alphabetically, the hooks numerically and the key changes numerically on different colored index cards. Index cards shall be typewritten and inserted in a durable binder. Attach the keys to the two sets of numbered tags supplied with the cabinet. (The permanent tag and the loan key tag). Instruct the owner in proper use of the system. Install cabinet as directed by the Contracting Officer's Representative.

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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 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.

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- D. Where removable mullions are specified at pairs with rim panic devices, provide mullion with key-removable feature.
- E. At non-rated openings with panic hardware, provide panic hardware with key cylinder dogging feature.
- F. Exit devices for fire doors shall comply with Underwriters Laboratories, Inc., requirements for Fire Exit Hardware. Submit proof of compliance.

2.17 FLUSH BOLTS (LEVER EXTENSION)

- A. Conform to ANSI A156.16. Flush bolts shall be Type L24081 unless otherwise specified. Furnish proper dustproof strikes conforming to ANSI A156.16, for flush bolts required on lower part of doors.
- B. Lever extension manual flush bolts shall only be used at non-fire-rated pairs for rooms only accessed by maintenance personnel.
- C. Face plates for cylindrical strikes shall be rectangular and not less than 25 mm by 63 mm (1 inch by 2-1/2 inches).
- D. Friction-fit cylindrical dustproof strikes with circular face plate may be used only where metal thresholds occur.
- E. Provide extension rods for top bolt where door height exceeds 2184 mm (7 feet 2 inches).

2.18 FLUSH BOLTS (AUTOMATIC)

- A. Conform to ANSI A156.16. 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

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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 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).

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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, 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.

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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.

2.28 THERMOSTATIC TEMPERATURE CONTROL VALVE CABINETS

- A. Where lock is shown, equip each cabinet door (metal) with lock Type E06213, conforming to ANSI A156.5. Key locks in Key Sets approved by Contracting Officer. See mechanical drawings and specifications for location of cabinets.
- B. Cabinet manufacturer shall supply the hinges, bolts and pulls. Ship locks to cabinet manufacturer for installation.

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

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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

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:
- Exit devices centerline of strike (where applicable) 1024 mm (40-5/16 inches).
 - Locksets and latch sets centerline of strike 1024 mm (40-5/16 inches).
 - Deadlocks centerline of strike 1219 mm (48 inches).
 - Hospital arm pull 1168 mm (46 inches) to centerline of bottom supporting bracket.
 - Centerline of door pulls to be 1016 mm (40 inches).
 - Push plates and push-pull shall be 1270 mm (50 inches) to top of plate.
 - Push-pull latch to be 1024 mm (40-5/16 inches) to centerline of strike.
 - 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

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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 doors)	Not over 1200 mm (4 feet)	113 mm (4-1/2 inches)

C. Hinge leaves shall be sufficiently wide to allow doors to swing clear of door frame trim and surrounding conditions.

D. Where new hinges are specified for new doors in existing frames or existing doors in new frames, sizes of new hinges shall match sizes of existing hinges; or, contractor may reuse existing hinges provided hinges are restored to satisfactory operating condition as approved by 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

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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.
 - 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 Latchset	F01 (Passage)
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-1A

<u>Each Door to Have:</u>	<u>NON-RATED (Infection Control)</u>
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Latchset	F01 (Passage)
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)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Air Seal, Pemko S88, or Equal)

HW-2

<u>Each Door to Have:</u>	<u>NON-RATED</u>
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 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)
1 Set Self-Adhesive Seals	BHMA R0E154
2 Coat Hooks	L03121
STONE THRESHOLD BY OTHER TRADES.	

HW-2A

<u>Each Door to Have:</u>	<u>NON-RATED - RESCUE HINGES</u>
Hinges	QUANTITY & TYPE AS REQUIRED

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	X HOSPITAL TIPS @ INSWING DOORS
	RESCUE HINGES
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 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)
1 Set Self-Adhesive Seals	BHMA R0E154
2 Coat Hooks	L03121
STONE THRESHOLD BY OTHER TRADES.	

HW-3Each Door to Have:NON-RATED

Hinges	QUANTITY & TYPE AS REQUIRED
	X HOSPITAL TIPS @ INSWING DOORS
1 Office Lock	F04 (Key from outside, inside always free)
1 Closer	C02011/C02021 (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)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Acoustic Seal, Pemko S88, or Eq)
1 Coat Hook	L03121

HW-3BEach Door to Have:RATED

Hinges	QUANTITY & TYPE AS REQUIRED
	X HOSPITAL TIPS @ INSWING DOORS
1 Office Lock	F04 (Key from outside, inside always free)

Renovate Emergency Department Facilities

1 Closer	C02011/C02021 (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)
1 Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Acoustic Seal, Pemko S88, or Eq)
1 Coat Hook	L03121

HW-4Each Door to Have:RATED

Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Classroom Lock	F08
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	
1 Power Supply for Card Reader	
1 Door Position Switch	
1 Request to Exit	Connect to Security
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.	
CARD READER BY DIVISION 28.	

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HW-4B

Each Door to Have:	NON-RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Classroom Lock	F08
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	
1 Power Supply	
1 Request to Exit	
1 Door Position Switch	Connect to Security
120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.	
CARD READER BY DIVISION 28.	

HW-5A

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Storeroom Lock	F07
1 Electric Strike	FAIL SECURE, 24 VDC
1 Closer	C02011/C02021 (PT4D, PT4F, PT4H)
1 Kick Plate	J102 (6" x 34" Satin Nickel)

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1	Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1	Floor Stop	L02121 x 3 FASTENERS
1	Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
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 & Power Supply	
1	Door Position Switch	
1	Request to Exit	

HW-5C (Store Room/Electrical Room)

<u>Each Door to Have:</u>		<u>RATED</u>
1	Continuous Hinge	A51031B x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Storeroom Lock	F07
1	Closer	C02011/C02021 (PT4D, PT4F, PT4H); 180 degree
1	Kick Plate	J102 (6" x 34" Satin Nickel)
1	Mop Plate (@ Inswing Doors)	J102 (6" x 34" Satin Nickel)
1	Floor Stop	L02121 x 3 FASTENERS
1	Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
1	Auto Door Bottom	BMHA R0G325 (Pemko 411_PKL, or Equal)
1	Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)

HW-6

<u>Each Door to Have:</u>		<u>RATED</u>
1	Continuous Transfer Hinge	A51031B x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 8-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
1	Continuous Hinge	A51031B x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS
1	Set Auto Flush Bolts	TYPE 25 LESS BOTTOM BOLT
1	Storeroom Lock	F07
1	Electric Unlatch Strike	MUNL (FAIL-SECURE), 24VDC (SECURITRON), OR EQUAL
1	Power Supply	REGULATED, FILTERED, 24VDC, AMPERAGE AS REQUIRED
1	Coordinator	TYPE 21A
1	Overlapping Astragal with	R5Y634 x R0E154 x THRU-BOLTS

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	Self-Adhesive Seal	
2	Armor Plates	J101 x 1.275 MM (0.050 INCH) THICKNESS
2	Edge Guard (@ Wood Doors)	J208M / J211 (VERIFY), CUT: HARDWARE
2	Floor Stops	L02121 x 3 FASTENERS
1	Set Self-Adhesive Seals	R0E154
2	180 Degree Closers	
1	Door Position Switch	
1	Card Reader	
1	Request to Exit	

POWER TRANSFER SHARED BY ELECTRIC STRIKE AND RE-ACTIVATION SENSOR WIRING
(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

*AT WOOD PAIRS RATED 45-MINUTES OR MORE, PROVIDE ELECTRIC STRIKE 310-2-3/4 (FOLGER ADAM OR EQUAL) IN LIEU OF SPECIFIC UNLATCH STRIKE.

HW-7

Each Motorized Roll-Down Door to Have: 1-Hour Rated & NON-RATED

1 Key Cylinder (for keyswitch) TYPE AS REQUIRED

BALANCE OF HARDWARE BY SECTION 08 33 00, COILING DOORS AND GRILLES

HW-9

Trackless Telescopic Breakout ICU Door: 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 ICU DOOR MFR. |

HW-9A

Trackless Telescopic Breakout ICU Sliding Door: NON-RATED, ISOLATION RM

- | | | |
|---|---|---|
| 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 ICU DOOR MFR. |
| 1 | Set Door & Door Bottom Seals | BY ICU DOOR MFR. |
| 1 | Latching device controlled from interior and able to be unlocked by staff
from exterior of room. | |

Renovate Emergency Department Facilities

HW - 11Each Door to Have: Reception Casework Door

2 Hinges	GATE SWING PIVOT (equivalent to Bommer 7112 and 7312)
2 Pushplate	As required
1 Closer	Self-closing Hinge/Pivot

HW-12AEach Pair Integrated Doors to Have: RATED

ALL HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

2 Magnetic Holder	Connected to Fire Alarm
Self-Adhesive Seals R0E154	

HW-SH-4CEach Pair to Have:RATED

2 Continuous Transfer Hinge	x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x 12-THRUWIRE TRANSFER X IN-HINGE ACCESS PANEL
2 Dust Proof Strike	L04021
2 Electrified Exit Device	TYPE 1 (E01-REX, E06) F13 LEVER
1 Key Cylinder	TYPE AS REQUIRED
2 Power Supply	TYPE REQUIRED BY PANIC MANUFACTURER X ADO BOARD
1 Overlapping Astragal with Self-Adhesive Seal	R0Y634 x R0Y154 x THRU-BOLTS
2 Automatic Door Operators	
2 Armor Plate	J101 x 1.275 MM (0.050 INCH) THICKNESS
1 Edge Guard (@ Wood Doors) Floor Stops	J208M / J211 (VERIFY), CUT: HARDWARE 2 L02121 x 3 FASTENERS
1 Set Self-Adhesive Seals	R0Y154
1 Card Reader	
1 Door Position Switch	
1 Request to Exit	

Renovate Emergency Department Facilities

POWER TRANSFER SHARED BY ELECTRIC PANIC AND RE-ACTIVATION SENSOR WIRING
(RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

AUTOMATIC DOOR OPERATOR AND CONTROLS BY SECTION 08 71 13, AUTOMATIC DOOR
OPERATORS.

120VAC POWER, CONDUIT, AND WIRING BY DIVISION 26.

CARD READER BY DIVISION 28.

TEMPORARY DOORS

HW-TEMP 1

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Rim Panic Device	F08 Lever
1 Cylinder	Type as Required
1 Kick Plate	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
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)

HW-TEMP 2

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
1 Alarmed Rim Panic Device	F08 Lever, Battery Alarm when Opened w/o Key-Off
1 Cylinder	Type as Required
1 Kick Plate	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
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
1 Set Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)

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HW-TEMP 3

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)

HW-TEMP 4

Each Door to Have:	RATED
Hinges	QUANTITY & TYPE AS REQUIRED X HOSPITAL TIPS @ INSWING DOORS
2 Panic Device	F08 Lever one side, Less Lever one side, Concealed Vertical Rods, less Bottom rod.
1 Cylinder	Type as Required
2 Kick Plate	J102 (6" x 34" Satin Nickel)
2 Closer	ANSI C02021 (Heavy Duty Parallel Arm Mount -PT4D, PT4F, PT4H)
2 Wall Stop	BHMA L02251 (Anti-Vandal Rubber (Trimco 1270CV, or Equal) or L52101 CONVEX
3 Silencers	BHMA L03011 (Trimco 1229A, or Equal)
2 Sets Door Gasketing	BHMA R0G154 (Smoke Seal, Pemko S88, or Eq)

EXTERIOR SINGLE DELAYED EGRESS DOORHW-E1

Each Integrated Door to Have:	NON-RATED
1 Continuous Hinge	A51031B x INTEGRAL HINGE GUARD CHANNEL X ADJUSTA-SCREWS x (2) 4-

Renovate Emergency Department Facilities

THRUWIRE TRANSFERS X IN-HINGE ACCESS
PANELS

- | | |
|----------------------------------|--|
| 1 Elec. Exit Device | DELAYED EGRESS w/ Req'd Alarms |
| 1 Key Cylinder | TYPE AS REQUIRED |
| 1 Power Supply | BY EXIT DEVICE MFR. |
| 1 Threshold | J35130 x SILICONE GASKET |
| 2 Door Sweep | 90100CNB (PEMKO), OR EQUAL |
| 1 Set Frame Seals | 2891AS X CSK SCREWS (PEMKO), OR
EQUAL |
| 1 Drip | R0Y976 |
| 1 Set Self-Adhesive Seals | R0E154 |
| 1 Remote Alarm at Reception Desk | |
| 1 Door Position Switch | Monitored by Security |

TOP POWER TRANSFER IS FOR RE-ACTIVATION SENSOR WIRING (RE-ACTIVATION SENSORS PROVIDED BY SECTION 08 71 13).

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

EXTERIOR AUTOMATIC DOORSHW-E2

Each [AC, ELR, REX, DPS] Integrated Door to Have: NON-RATED

BALANCE OF HARDWARE BY SECTION 08 17 10, INTEGRATED DOOR ASSEMBLIES

- - - E N D - - -

SECTION 08 71 13.11**LOW ENERGY POWER ASSIST DOOR OPERATORS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies low energy power assisted automatic operation of swing doors. The door operator system shall be complete including operator, controls, door arm and operator enclosure (header and cover).

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. Sealants; Section 07 92 00, JOINT SEALANTS.
- D. Steel doors; Section 08 11 13, HOLLOW METAL DOORS AND FRAMES.
- E. Wood doors; Section 08 14 00, INTERIOR WOOD DOORS.
- F. Aluminum frames entrance work; Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS.
- G. Door hardware; Section 08 71 00, DOOR HARDWARE.
- H. Glass and glazing of doors and frames; Section 08 80 00, GLAZING.
- I. Finish Color, Section 09 06 00, SCHEDULE FOR FINISHES.
- J. Smoke detectors for control of fire/smoke doors to be wired per Section 28 31 00, FIRE DETECTION AND ALARM.
- K. Electric general wiring, connections and equipment requirements; Division 26, ELECTRICAL.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. Power assisted door operators, controls and other equipment shall be products of a manufacturer regularly engaged in manufacturing such equipment for a minimum of three years.
- B. One manufacturer of automatic door equipment shall be used throughout the building project.

Renovate Emergency Department Facilities

1.4 WARRANTY

- A. Power assisted door operators, controls and other related equipment shall be subject to the terms of the "Warranty of Construction", FAR clause 52.246-21, except that the warranty period shall be two years in lieu of one year.

1.5 MAINTENANCE MANUALS

- A. In accordance with Section 01 00 00, GENERAL REQUIREMENTS Article titled "INSTRUCTIONS," furnish three copies of maintenance manuals and instructions on automatic door operators.

1.6 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's literature and data describing operators, power units, controls, door hardware and safety devices.
- C. Shop Drawings:
 - 1. Showing location of controls and safety devices in relationship to each automatically operated door. This includes templates, wiring diagrams, fabrication details, anchorage and other information to providers of related work to coordinate the proper installation of the door operators.

1.7 DESIGN CRITERIA

- A. Power assisted automatic door equipment shall accommodate normal traffic as well as the weight of the doors.
- B. Equipment: UL approved and comply with applicable codes. Motors shall be rated minimum one-quarter horsepower and shall be single phase and 115 volts.
- C. Electrical Wiring; Provide wiring so that only a single power supply is required. Equipment and wiring shall be as specified in Division 26, ELECTRICAL.

1.8 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American National Standards Institute (ANSI):
 - 1. ICC/ANSI A117.1-03 Guideline for Accessible and Usable Buildings and Facilities-Providing Accessibility and Usability for Physically Handicapped People
- C. Builders Hardware Manufacturers Association, Inc. (BHMA):

Renovate Emergency Department Facilities

1. 9-07 Power Assist and Low Energy Power Operated Doors

PART 2 - PRODUCTS**2.1 OPERATORS**

- A. Automatic door operators shall be for commercial doors and shall be electromechanical and surface mounted above the door to the header or transom bar. The opening force shall be generated by a permanent magnet DC motor driving a combination spiral bevel/spur gear reducer and transmitted to the door through an arm linkage. Opening speed shall be adjustable and feature dual backcheck control allowing adjustment of backcheck speed and position. Closing shall be by spring force generated by a metal compression spring. The spring shall reduce manual opening force to not more than 67 N (15 lbf). The minimum diameter of spring wire shall be .007mm (172 in.). Under the specified design load of the door, the spring shall be capable of performing 2,000,000 cycles before fracture. Adjustable closing speed and fixed latch speed shall control the door in the closing cycle. The doors shall be operated manually at any time without damage to the operator or components.
- B. All operators shall have checking mechanism providing cushioning action at last part of door travel, in both opening and closing cycle. Operators shall recycle doors instantaneously to full open position from any point in closing cycle when control switch is reactivated.
- C. Operator shall be swinging type enclosed in housing. Operator shall open door by energizing motor and shall stop by electrically reducing voltage and stalling motor against mechanical stop. Door shall close by means of spring energy, and close force shall be controlled by gear system and motor being used as dynamic break without power. System shall operate as manual door control in event of power failure. Opening and closing speeds shall be adjustable:
 1. Swing Operator Housing: Housing shall be 140 mm (5-1/2 inches) wide by 150 mm (6 inches) high aluminum extrusions with enclosed end caps for application to 100 mm (4 inch) and larger frame systems. All structural sections shall have a minimum thickness of 3.7 mm (0.146 inch) and be fabricated of 6063-T5 aluminum alloy.
 2. Swing Power Operator: Completely assembled and sealed unit which shall include helical gear drive transmission, mechanical spring and bearings, all located in cast aluminum case and filled with special lubricant for extreme temperature conditions. A "DC" shunt-wound permanent magnet motor with sealed ball bearings shall be attached to transmission system. Complete unit shall be rubber mounted with provisions for easy maintenance and replacement, without removing door from pivots or frame.
 3. Connecting hardware for swing overhead concealed type power operator shall have drive arm attached to door with a pin linkage rotating in a self-lubricating bearing and adjustable slide block, traveling in an interconnected track and top pivot assembly. Top track and pivot assembly shall be fabricated of steel. Door shall not pivot on shaft of operator.

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4. Electrical Control: Operator shall have a self contained electrical control unit, including necessary transformers, relays, rectifiers, and other electronic components for proper operation and switching of power operator. Relays shall be plug-in type for individual replacement and all connecting harnesses shall have interlocking plugs. Control shall also include time delay for normal cycle. Swing door control shall include safe-swing circuit with optional switching which automatically limits power and slows door when approached from the doors swing area.
5. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.

2.2 MICROPROCESSOR CONTROLS

- A. The system shall include a multi-function microprocessor control providing adjustable hold open time (1 - 30 sec.), LED indications for actual position unknown, system status, open obstruction shutdown, activation signal, safety mat/sensor signal, Stop-and-Hold signal, and mode selector switches providing a means for easy field selection of the following functions: push-to-operate, latch assist and stack pressure. Control shall be capable of receiving activation signals from any device with normally open dry contact output.
 1. With push-to-operate function enabled, the control shall provide a means of initiating a self-start activation circuit by slightly pushing the door open at any point in the door swing.
 2. Latch Assist shall provide a two second impulse in the close direction to overcome restrictions with locking devices of pressure differentials, allowing the unit to operate in standard time delay mode, and permitting the door to close from the full open position after the hold time is satisfied. All activation modes shall provide fully adjustable opening speed.
- B. The door shall be held open by low voltage applied to the continuous duty motor. The control shall include an adjustable safety circuit that monitors door operation and shuts the motor off if an open obstruction is sensed. The control shall include a recycle feature the reopens the door if an obstruction is sensed at any point during its closing cycle. The control shall include a standard three position toggle switch with functions for ON, OFF, and HOLD OPEN.

2.3 ENCLOSURE

- A. Operator shall be completely self-contained within an extruded aluminum housing (alloy 6063-T6) to conceal operator mechanism and mounting brackets and with removable access cover with an overall maximum size of 140 mm (5-1/2 inches) wide by 150 mm (6 inches) deep. Header color shall be integral color anodized/painted to match adjacent storefront/frame finish.

2.4 ACTIVATION DEVICES

- A. Manual: Push-to-operate; manually pushing the door shall activate the automatic opening cycle. Door shall automatically close after timer delay expires.

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- B. Opening and closing force, measured 25 mm (1 inch) out from the lock stile of the door, shall not exceed 67 N (15 lbf) to stop the door when operating in either direction or cycle.
- C. Opening Time: Doors shall be field adjusted so that opening time to back check or 80 degrees, whichever occurs first, shall be 3 seconds or longer as required in Table 1. Backcheck shall not occur before 60 degrees opening.
1. Total opening time to fully open shall be as in Table II.
- D. Closing Time:
1. Doors shall be field adjusted to close from 90 degrees to 10 degrees in 3 seconds or longer as required in Table 1.
 2. Doors shall be field adjusted to close from 10 degrees to fully close position in not less than 1.5 seconds.
 3. Doors shall be field adjusted to remain fully open for not less than 5 seconds.
 4. Table 1 provides speed settings for various widths and weights of doors for obtaining results complying with this paragraph.
- E. Cycle Tests:
1. Low Energy Power Operated, Low Energy Power Open and Power Assist Operators shall be cycle tested for 300,000 cycles.
 2. Use the widest and heaviest door specified as a test specimen. Narrower or lighter doors of the same configurations shall then be considered to meet the cycle test requirements.

Table 1

Minimum Opening Time to Backcheck or 80 degrees, which ever occurs first and the Minimum Closing Time from 90 degrees to Latch Check or 10 degrees.

"D" Door Leaf Width- mm (inches)	"W" Door Weight in kg (pounds) Matrix Values are in seconds				
	(100) 45.4	(56.7) 125	(68.0) 150	(79.4) 175	(90.7) 200
(762) 30	3.0	3.0	3.0	3.0	3.5
(914) 36	3.0	3.5	3.5	4.0	4.0
(1067) 42	3.5	4.0	4.0	4.5	4.5

Doors of other weights and widths can be calculated using the formula;

$T = DvW/133$ in US units $T = DvW/2260$ in SI (metric) units

Where:

T= Time, seconds

D= Door width, mm (inches)

W= Door weight, kg (lbs)

The values for "T" time have been rounded up to the nearest half second.

These values are based on a kinetic energy of (1.25 lbf-ft).

Table II

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Total Opening Time to Full Open Position

Backcheck at 60 degrees	Backcheck at 70 degrees	Backcheck at 80 degrees
Table 1 plus 2 seconds	Table 1 plus 1.5 seconds	Table 1 plus 1 second

Note: To determine maximum times from close to full open, the operator shall be adjusted as shown in the chart. Backcheck occurring at a point between positions in Table II shall use the lowest setting. For example, if the backcheck occurs at 75 degrees, the full open shall be the time shown in Table 1 plus 1.5 seconds.

2.5 POWER UNITS

- A. Provide separate self-contained electric circuits for automatic operators located on each floor of the building. Interruption or failure of power circuits for operators located on one floor of the building shall not interfere with continuous performance of automatic operated doors located on other floors. Capacity and size of power circuits shall be in accordance with automatic operator manufacturer's specifications.

2.6 SAFETY DEVICES

- A. Time delay switches shall be adjustable between 5 to 60 seconds and shall control closing cycle of doors.
- B. Each swing door shall have installed a motion sensor to detect any person standing in the door swing path and prevent the door from opening.
- C. Motion sensors shall consist of detection modules, factory prepared to be attached to each side of the lock/strike stile, an armored flex link power cable and bracket assembly, factory prepared for attachment to the pivot stile; a logic board and a position encoder which shall mount to the operator. The detection modules shall contain transmitting and receiving diodes and sense multidimensional zones for detection of people and/or objects in the door area. Detection modules shall be high impact, shock resistant zinc castings with tinted lenses. The swing door sensor system shall provide complete operate and safety zone coverage. These zones shall be fully adjusted to meet specific jobsite conditions (sidewalls, adjacent panels, etc.) The system shall not be affected by ultrasonic, ambient light or radios frequencies within the vicinity of the swing door.
- D. Each swing door shall have installed a re-activation sensor mounted on the push-side door face near the top detect any person standing in the door swing path and prevent the door from closing. Wiring for the re-activation sensor between the door and frame shall be concealed in a power transfer device, hinge or pivot provided under Section 08 71 00; wire chase in door provided under door section.
- E. Door shall stop and reverse its swing when an object is detected in the path of travel, when it "encounters" a person in the path of travel.

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PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Coordinate installation of equipment with other related work. Manual controls and power disconnect switches shall be recessed or semi-flush mounted in partitions. Secure operator components to adjacent construction with suitable fastenings. Conceal conduits, piping, and electric equipment in finish work.
- B. Install power units in locations shown. Where units are to be mounted on walls, provide metal supports or shelves for the units. All equipment, including time delay switches, shall be accessible for maintenance and adjustment.
- C. Operators shall be adjusted and must function properly for the type of traffic (pedestrians) expected to pass through doors. Each door leaf of pairs of doors shall open and close in synchronization. On pairs of doors, operators shall allow either door to be opened manually without the other door opening.
- D. Install controls at positions shown and make them convenient for particular traffic expected to pass through openings. Maximum height of push plate wall switches from finished floors shall be 40 inches unless otherwise approved by the Contracting Officer's Representative.

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.

- - - 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. Doors: Section 08 11 13, HOLLOW METAL DOORS AND FRAMES, and Section 08 14 00, WOOD DOORS.
 3. Mirrors: Section 10 28 00, TOILET, BATH, AND LAUNDRY ACCESSORIES.
 4. Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS.
 5. Section 08 41 13, ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
 6. Section 08 56 53, BLAST-RESISTANT FAÇADE SYSTEMS
 7. Section 09 06 00, SCHEDULE FOR FINISHES, for pattern glass.

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. Building Enclosure Vapor Retarder and Air Barrier:
 - 1. Utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
 - 2. Maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.
- B. Glass Thickness:
 - 1. Select thickness of exterior glass to withstand dead loads and wind loads acting normal to plane of glass at design pressures calculated in accordance with ASCE 7 code.
 - 2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
 - 3. Test in accordance with ASTM E 330.
 - 4. Thicknesses listed are minimum. Coordinate thicknesses with framing system manufacturers.
- C. Exterior Glass Blast Design Criteria and Structural Performance:
 - a. Refer to SECTION 08 56 53 for blast requirements.

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.

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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.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Schedule delivery to coincide with glazing schedules so minimum handling of crates is required. Do not open crates except as required for inspection for shipping damage.
- B. Storage: Store cases according to printed instructions on case, in areas least subject to traffic or falling objects. Keep storage area clean and dry.
- C. Handling: Unpack cases following printed instructions on case. Stack individual windows on edge leaned slightly against upright supports with separators between each.
- D. Protect laminated 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.

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- 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
 - 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

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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.
 - 2. Thickness, as indicated.
- C. Patterned Glass:
 - 1. Fabricated from clear glass, pattern as indicated.
 - 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).
- C. Tempered Patterned Glass:
 - 1. ASTM C1048, Kind FT; fabricated from patterned glass.
 - 2. Thickness as indicated .

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.

2.5 INSULATING GLASS UNITS

- A. Provide factory fabricated, hermetically sealed glass unit consisting of two panes of glass separated by a dehydrated air space.

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- B. Assemble units using glass types specified:
- C. Sealed Edge Units (SEU):
 - 1. Conform to ASTM E774, Class C performance requirements.
 - 2. Air Space not less than 13 mm (1/2 inch).
 - 3. U-Value: 0.29 or better.
 - 4. SHGC: 0.29 or better.
- D. Insulating Glass Units Types: As specified in Section 09 06 00, SCHEDULE FOR FINISHES.

2.6 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. 120-minute Fire-Resistive-Glazing: Gel insulated .tempered glass; impact safety with hose stream and full radiant heat protection.
 - 1. Thickness: Manufacturer's standard thickness for fire rating, typically 39 mm (1-1/2 inch).
 - 2. Impact Safety Rating: Complies with CPSC Cat. I & II.
 - 3. Visual appearance: Clear.
 - 4. Visual appearance: Clear.
- C. 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.

2.7 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.

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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:
1. Type S.
 2. Class 25
 3. Grade NS.
 4. Shore A hardness of 25 to 30 Durometer.
- J. Structural Sealant: ASTM C920, silicone acetoxycure:
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.

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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.
- 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.

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- 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.
- I. Insulating Glass Units:
 - 1. Glaze in compliance with glass manufacturer's written instructions.
 - 2. When glazing gaskets are used, they shall be of sufficient size and depth to cover glass seal or metal channel frame completely.
 - 3. Do not use putty or glazing compounds.
 - 4. Do not grind, nip, cut, or otherwise alter edges and corners of fused glass units after shipping from factory.
 - 5. Install with tape or gunnable sealant in wood sash.
- J. Fire Resistant Glass:
 - 1. Fire resistant glass: Glaze in accordance with UL design requirements.

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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.

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.

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- 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.

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	1. Access Doors	08 31 13
2.3.E.	Ceramic Mosaic Wall Tile	09 30 13
2.3.F.	Resilient Base	09 65 13
2.3.G.	Solid Polymer Wall Panels	09 77 60
2.3.H.	Decorative Wood Veneer Wall Panel	09 77 50
2.3.I.	Wood Veneer Wall Panel	09 77 50
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.M.	Handrail / Crash Rail	10 26 00
2.3.N.	Plastic Laminate Wall Panels(Deduct alternate #5)	09 77 00
2.3.O.	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.E.	Window Shades	12 24 00

EXTERIOR WALLS & ACCESSORIES

2.8.A.	Glazing	08 80 00
2.8.B.	Aluminum Curtain Wall System	08 56 53/ 08 44 13
2.8.C.	Exterior Sunshades	08 44 13
2.8.D.	Exterior Composite Metal Panels	07 42 43

PART 2 - PRODUCTS

Expand Emergency Department Facilities

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-19	PPG/Matthews	Color: to match P-3 (Steel Frames)
P-3	PPG	Color: Graham White Duranar Sunstorm Coating 3-coat with "XL" advantage Fluoropolymer clear topcoat Typical Exterior Metal Panels & all exterior metal trim - Fascia, Louvres)
P-4	Benjamin Moore Powder Coated	P42-08/P42-84 Safety White, Superspec P42 Epoxy Enamel Paint HP Superspec WB Polyimide H/G (Column Covers)

B. Texture:

1. EXT: Exterior Paint as specified
2. LL: Low-Luster
3. SG: Semi-Gloss
4. EGS: Eggshell
5. HG: High-Gloss

2.2 FLOORING

A. Concrete (CSI):

1. All exposed concrete in the Interior shall be sealed using Scofield Selectseal-W

	<u>FINISH</u>	<u>PRODUCT</u>	<u>COLOR</u>
CS	Clear Sealed	Scofield Selectseal	Natural Concrete

B. Porcelain Mosaic 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:	Crossville, Structure	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

C. Resilient Sheet Flooring - Resilient sheet flooring with glue down installation(RSF):

1. Flooring:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
RSF-1:	Johnsonite	Optima	873 Koala Bear
RSF-2:	Johnsonite	Optima	874 Hardwire

2. Rubber Base:

Refer to 2.3 F for Resilient Base Information

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D. Welded Sheet Flooring - Resilient sheet flooring with heat welded seams and Integral Cove Base (WSF):

1. Flooring:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WSF-1:	Johnsonite	Optima	873 Koala Bear
WSF-2:	Johnsonite	Optima	874 Hardwire

2. Coved Base:

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WSFB-1:	Johnsonite	Optima	873 Koala Bear
WSFB-2:	Johnsonite	Optima	874 Hardwire

3. Welding Rod: Coordinate with Sheet Flooring designated above

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
Rod1:	Johnsonite	Weld Rod	To match 873 Koala Bear
Rod2:	Johnsonite	Weld Rod	To match 874 Hardwire

E. Carpeting (CPT):

1. Carpeting:

	<u>MANUFACTURER</u>	<u>PATTERN</u>	<u>COLOR</u>
CPT-1:	Shaw Contract	Laser Cut 59011	95761 Layered
Install Quarter turn			

	<u>MANUFACTURER</u>	<u>PATTERN</u>	<u>COLOR</u>
CPT-2:	Shaw Contract	Overlay 59598	95761 Layered
Install Quarter turn			

F. Epoxy Terrazzo (TER): Divider strips: 1/8" White Zinc.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
TR-1:	Terrazzo & Marble Supply	Epoxy Terrazzo	Custom Color to Match Architect's Control Samp. (Field Color)
TR-2:	Terrazzo & Marble Supply	Epoxy Terrazzo	Custom Color to Match Architect's Control Samp. (Seating Color)

G. Terrazzo Tile (TER) (**Deduct Alternate #8**)

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
TR-1:	Wausau	12x24 Tile	WM 753 (small aggregate) (Field Color)
TR-2:	Wausau	12x24 Tile	WT 753 (large aggregate) (Tile at Seating)

H. Recessed Walk off Mat (WM): Mat to have 1-1/4" Deep Frame

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>FINISH</u>
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WM	Mats Inc.	NUWAY	Aluminum Scraper Bars With Gray Wiper Strips
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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-19: | Paint | To match Exterior Metal panels |

B. Wood Doors:

	<u>MANUFACTURER</u>	<u>FINISH</u>
MPL	Marshfield Doors	Maple-White, Quarter Sliced, Finish: Clear 0-95

C. Kick-Mop and Armor Plates:

1. Refer to door schedule for location.
2. Install P-lam with Grain running horizontally so it is perpendicular to the direction of the Wood door grain.
3. Armor Plate to be Plastic Laminate unless otherwise noted in the door schedule.

	<u>MANUFACTURER</u>	<u>COLOR</u>
PL-1	Wilsonart	7909-78 Fusion Maple Premium
PL-2	Construction Specialties, Inc	Acrovyn 4000 #933 Mission White

D. Special Doors:

1. Access Doors: Painted finish, color and texture to match color and texture of adjacent walls or gypsum board ceilings.

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:	Crossville	Empress White A215 (Tile 6" x 24")

4. Coved Base Tile

	<u>MANUFACTURER</u>	<u>COLOR</u>
PTB-1:	Crossville Structure	6x12 Cove base, AV224 Timber

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

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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. Decorative Wood Veneer Wall Panel (DWP-1)

1. Factory Finished w/Manufacturer provided Black Acoustic Panel w/Preinstalled Mounts for Wall Installation

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
DWP-1:	Hightower	SONO Decorative Acoustic Panel	Birch, Clear Lacquered

I. Wood Veneer Wall Panel System (WV-1) & Base (WVMB)

1. Aluminum Honeycomb panels 19 Gauge with Wood Veneer. Cherry Veneer, Flitch to be approved by architect

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WV-1:	Lindner USA, Inc.	COMPLine	Cherry Wood Veneer
WVMB:	Lindner USA, Inc.	COMPLine	14 gauge 304 #4 Stainless Steel

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	Molding as specified	Clear Anodized Aluminum

K. Pre-fabricated Metal Column Covers

1. See enlarged plans.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
	Rigidized Metals Corp	Stainless Steel Pre-fabricated Metal Column Covers	304 SS Finish: Sandtex

L. Wall Guard (WG-1)

1. See finish plan, finish schedule and interior elevations for location.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
WG-1:	Construction Specialties Inc.	Acrovyn 4000 PVC-free	#933 Mission White Suede Texture

M. Handrail/Crash Rail

1. See finish plan for location.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
	Construction Specialties Inc.	PRWSAM	Natural Maple 008, Stainless Steel

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- N. Plastic laminate Wall Panel System (WPS)(**DEDUCT ALTERNATE #6**)
Using HDPL-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.	WPS	Shadowline Recessed Reveal	Clear Satin Anodized

- O. Interior Glazing
1. See Glazing schedule for details.

MANUFACTURER
IG-1 Skyline Design
3/8" Fully Tempered, Patterned Monolithic Glass, Spec No: 25369
side 1: Sateen Pattern
side 2: Sateen Pattern

MANUFACTURER
IG-2 Skyline Design
1/4" Starfire Tempered Glass with Custom Henry Domke image
side 1: No pattern
side 2: AST3 Vitracolor finish

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 Tegular
 - d. Color: White
 2. AT-2:
 - a. Manufacturer: Armstrong World Industries.
 - b. Size: 24" x 72" with 6" slots for linear diffusers/lighting.
 - c. Product: TechZone w/ Optima w/Edge Profile: Square Tegular
 - d. Color: White
 3. AT-3:
 - a. Manufacturer: Armstrong World Industries.
 - b. Size: 24" x 48" with 6" slots for linear diffusers/lighting.
 - c. Product: TechZone w/ Optima w/Edge Profile: Square Tegular

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d. Color: White

4. LWC-1:

- a. Manufacturer: 9 Wood
- b. Size: 2 1/4" x 3/4" x 3/4" Reveal
- c. Product: #2113-4, Panelized Linear w/1" Black Felt Liner
- d. Finish: Hemlock(Solid, Vertical Grain)w/9W1004 Cedar Stain

B. Suspension System

- a. for AT-1, AT-2 & AT-3:

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
Armstrong	Silhouette 9/16"	White
	Bolt slot-1/8" Reveal	

- b. for LWC-1

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
USG Donn Dx	Heavy Duty 15/16"	Flat Black #205

- c. Acoustic Insulation for LWC-1

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
Owens Corning	Quiet R Duct Liner Board	2" Black

2.5 ARCHITECTURAL WOODWORK

A. Plastic Laminate (PL):

	<u>MANUFACTURER</u>	<u>COLOR</u>
HDPL-1	Wilsonart	7925-38 Monticello Maple Premium

B. Solid Surfacing Material (SS-1)

	<u>MANUFACTURER</u>	<u>COLOR</u>
SS-1	Corian	Whisper(@ All Work Surfaces)

C. Quartz Surface Material (QTZ)

	<u>MANUFACTURER</u>	<u>COLOR</u>
QTZ-1 Counter)	Cambria	2170 Desert Collection (@ Reception

D. Resin Panel w/Engraved Text (RP)

Text to Back Engraved and Infilled with White paint. Lightblocks to have renewable matte finish

	<u>MANUFACTURER</u>	<u>COLOR</u>
RP	LightBlocks 1/2"	Ice

E. Casework Hardware

Adjustable Shelf Standards and Supports

<u>MANUFACTURER</u>	<u>TYPE</u>
Knape & Vogt	Model 255 with 256 support

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Corner Hinge	<u>MANUFACTURER</u> Aximat	<u>TYPE</u> Model 300
Invisible Hinge	<u>MANUFACTURER</u> SOSS	
Cabinet Pulls	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model #106.74.902 with flush handles
Drawer Slides	<u>MANUFACTURER</u> Accuride	<u>TYPE</u> Model 3832 or 7432 box drawers 4034 file drawers
Counter Support	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Hegbo Model 287.45.477
Grommets	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model 631.35.214 Color:RAL 9006
Cabinet Pulls	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model #106.74.902 with flush handles
Label Frames	<u>MANUFACTURER</u> Hafele	<u>TYPE</u> Model 168.02.761 Nickel Platted 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. Corner Guards (CG):
1. Refer to the Enlarged Floor Plans and Interior Elevations for Corner Guard locations and dimensions.
 2. Corner Guards to be installed from floor to ceiling at all locations.
 3. Color of Corner Guards to match Paint color of adjoining wall surface.
 4. Refer to 2.1 A for Interior paint color information.
- | | | | |
|-------|---------------------|----------------|----------------------|
| | <u>MANUFACTURER</u> | <u>PRODUCT</u> | <u>COLOR/TEXTURE</u> |
| CG-1: | Fry Reglet | Corner Trim | Primed |
| | | Dim per Detail | |
| CG-2: | Fry Reglet | End closure | Primed |
| | | Dim per Detail | |
- D. Window Shades (WS):
1. Refer to the enlarged Reflected Ceiling Plans for locations.
 2. Shade fabric shall be Thermoplastic Olefin (TPO) fiber filaments

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with a TPO coating

3. Openness factor shall be 3%
4. Shade Motor Drive System shall be WhisperShade IQ.
5. Electronically controlled shades shall be controlled by Sun Dialer, an automated daylight solar tracking shade control system.
6. All window shades shall be electronically controlled with daylight tracking unless otherwise noted on the reflected ceiling plans.

	<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR/TEXTURE</u>
WS-1:	MechoShade Systems	EcoVeil	1570 Shadow Grey

2.7 SITE

A. Site Work Paving:

1. All stained concrete in the Exterior shall be sealed using Scofield Selectseal-W
2. All Construction Joints shall be sealed with Lithoseal Trafficalk-3G Color-matched joint sealant. Color to match adjacent surface.

2.8 EXTERIOR WALLS

A. Glazing:

	<u>MANUFACTURER</u>
G-1	Viracon

Low E Sealed-Edge insulating Glass Unit- Clear, blast mitigation (50' stand off distance)

Outer Lite: 6 mm (1/4") Heat-Strengthened (HS) Glass; Air Gap: 13 mm (1/2")

Inner Lite: 4.75 mm (3/16") Annealed Glass + 1.5 mm (0.060") PVB + 4.75 mm (3/16") Annealed Glass

Low E coating on No.2 Surface (VNE-63)

	<u>MANUFACTURER</u>
G-2	Viracon

Laminated Glass - Clear; 6mm (1/4").

Two layers of 3mm (1/8") Annealed Glass with 1.52 mm (0.060") PVB interlayer.

B. Aluminum Curtainwall: Kawneer 1600 SS

<u>MANUFACTURER</u>	<u>COLOR</u>
Kawneer	PPG-Duranar Graham White

1. Finish: Factory applied fluoropolymer coating, color to match PPG Industries/Matthews Paint Color palette.

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
PPG	Duranar	Graham Whit

C. Exterior Aluminum Sun Shades: TBD

1. Finish: Factory applied fluoropolymer coating, color to match PPG

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Industries/Matthews Paint Color palette.

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
PPG	Duranar	Graham white

D. Metal Panels:

1. Finish: Factory applied fluoropolymer coating.

<u>MANUFACTURER</u>	<u>PRODUCT</u>	<u>COLOR</u>
Centria	Duranar	PPG Graham White

PART 3 - EXECUTION**3.1 FINISH SCHEDULE ABBREVIATIONS**

AP	Acoustical Panel
ABGB	Abuse Resistant Gypsum Board
Arch.	Architectural
AWP	Acoustical Wall Panel
CSLAB	Concrete Slab
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
MB	Marker Board
MRGB	Moisture Resistant Gypsum Board
MTL	Metal
NF	Natural Finish
P	Paint (Exterior, Interior, Transparent Finishes)
PL	Plastic Laminate
PWC	Presentation Wall Covering
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
WWC	Wood Wall Covering

3.2 GENERAL NOTES

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- 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. All Interior Finishes to comply with maximum flame spread requirements per the IBC

3.3 INTERIOR COLOR AND FINISH SCHEDULE

- A. Schedule is included with the Contract Drawings.

End

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. 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. Load bearing framing: Section 05 40 00, COLD-FORMED METAL FRAMING.
- D. Support for wall mounted items: Section 05 50 00, METAL FABRICATIONS.
- E. 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.
- F. 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:

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1. Studs, runners and accessories.
2. Hanger inserts.
3. Channels (Rolled steel).
4. Furring channels.
5. Screws, clips and other fasteners.

C. Shop Drawings:

1. Typical ceiling suspension system.
2. Typical metal stud and furring construction system including details around openings and corner details.
3. Typical shaft wall assembly
4. Typical fire rated assembly and column fireproofing showing details of construction same as that used in fire rating test.
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

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8. C754-09 Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
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:

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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.
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.

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PART 3 - EXECUTION**3.1 INSTALLATION CRITERIA**

- A. Where fire rated construction is required for walls, partitions, columns, beams and floor-ceiling assemblies, the construction shall be same as that used in fire rating test.
- B. Construction requirements for fire rated assemblies and materials shall be as shown and specified, the provisions of the Scope paragraph (1.2) of ASTM C754 and ASTM C841 regarding details of construction shall not apply.

3.2 INSTALLING STUDS

- A. Install studs in accordance with ASTM C754, except as otherwise shown or specified.
- B. Space studs not more than 610 mm (24 inches) on center.
- C. Cut studs 6 mm to 9 mm (1/4 to 3/8-inch) less than floor to underside of structure overhead when extended to underside of structure overhead.
- D. Where studs are shown to terminate above suspended ceilings, provide bracing as shown or extend studs to underside of structure overhead.
- E. Extend studs to underside of structure overhead for fire, rated partitions, smoke partitions, shafts, and sound rated partitions .
- 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

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installation of pipes, conduits, carriers and similar items.

2. Use studs or runners as cross bracing not less than 63 mm (2-1/2 inches wide).
- J. Form building seismic or expansion joints with double studs back to back spaced 75 mm (three inches) apart plus the width of the seismic or expansion joint.
- K. Form control joint, with double studs spaced 13 mm (1/2-inch) apart.

3.3 INSTALLING WALL FURRING FOR FINISH APPLIED TO ONE SIDE ONLY

- A. In accordance with ASTM C754, or ASTM C841 except as otherwise specified or shown.
- B. Wall furring-Stud System:
 1. Framed with 63 mm (2-1/2 inch) or narrower studs, 600 mm (24 inches) on center.
 2. Brace as specified in ASTM C754 for Wall Furring-Stud System or brace with sections or runners or studs placed horizontally at not less than three foot vertical intervals on side without finish.
 3. Securely fasten braces to each stud with two Type S pan head screws at each bearing.
- C. Direct attachment to 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,

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tackboards, wall-hung casework, handrail brackets, recessed fire extinguisher cabinets and other items like auto door buttons and auto door operators supported by stud construction.

- B. Provide additional studs where required. Install metal backing plates, or special metal shapes as required, securely fastened to metal studs.

3.5 INSTALLING SHAFT WALL SYSTEM

- A. 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.

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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.
 - 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 installation and finishing of gypsum board.

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. 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.
- D. Acoustical Sealants: Section 07 92 00, JOINT SEALANTS.

1.3 TERMINOLOGY

- A. Definitions and description of terms shall be in accordance with ASTM C11, C840, and as specified.
- B. Underside of Structure Overhead: In spaces where steel trusses or bar joists are shown, the underside of structure overhead shall be the underside of the floor or roof construction supported by the trusses or bar joists.
- C. "Yoked": Gypsum board cut out for opening with no joint at the opening (along door jamb or above the door).

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data:
 - 1. Cornerbead and edge trim.
 - 2. Finishing materials.
 - 3. Laminating adhesive.
 - 4. Gypsum board, each type.
- C. Shop Drawings:
 - 1. Typical gypsum board installation, showing corner details, edge trim

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details and the like.

2. Typical sound rated assembly, showing treatment at perimeter of partitions and penetrations at gypsum board.
3. Typical shaft wall assembly.
4. Typical fire rated assembly and column fireproofing, indicating details of construction same as that used in fire rating test.

D. Samples:

1. Cornerbead.
2. Edge trim.
3. Control joints.

E. Test Results:

1. Fire rating test, each fire rating required for each assembly.
2. Sound rating test.

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
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

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- 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.
- 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.

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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:
 - 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.

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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: mill finish

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.

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

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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 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.

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- 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 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

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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 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

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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.
 - 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.

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- 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 designated containers and protect from moisture and contamination.

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SECTION 09 30 13**CERAMIC/PORCELAIN TILING****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies porcelain, quarry tile, terrazzo divider strips, waterproofing membranes for thin-set applications, tile backer board.

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. Sealing of joints where specified: Section 07 92 00, JOINT SEALANTS.
- D. 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.
- E. 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. Quarry tile, each type, color, and size.
 - 3. Porcelain tile, each type, color, patterns and size.
 - 4. Wall (or wainscot) tile, each color, size and pattern.
 - 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.

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5. Divider strip.
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

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Resistant, Water Cleanable Tile-Setting and Grouting Epoxy

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

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for Construction, Industrial and Agricultural Applications

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.

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- c. Pre-wax tiles grouted with epoxy
- 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 bullnose shapes.
 - c. Internal corners: Use cove shapes.
 - d. Base to floor internal corners: Use special shapes providing integral cove vertical and horizontal joint.
 - e. Base to floor external corners: Use special shapes providing bullnose vertical edge with integral cove horizontal joint. Use stop at bottom of openings having bullnose return to wall.
 - f. Wall top edge internal corners: Use special shapes providing integral cove vertical joint with bullnose top edge.
 - g. Wall top edge external corners: Use special shapes providing bullnose vertical and horizontal joint edge.
 - h. For quarry tile work, use cove and bullnose shapes as applicable.

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,

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shall be as specifically recommended by the backer unit manufacturer.

2.4 FASTENERS

- A. Screws for Cementitious Backer Units.
 - 1. Standard screws for gypsum board are not acceptable.
 - 2. Minimum 11 mm (7/16 inch) diameter head, corrosion resistant coated, with washers.
 - 3. ASTM C954 for steel 1 mm (0.033 inch) thick.
 - 4. ASTM C1002 for steel framing less than 0.0329 inch thick.

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.

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1. Unsanded grout mixture for joints 3.2 mm (1/8 inch) and narrower.
 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.

E. Cleavage Membrane:

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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.
- B. Install in accordance with ANSI A108.11 except as specified otherwise.

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- 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 ceramic and quarry tile floors and 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 "Specifications for Installation of Ceramic Tile" applicable to methods of installation.

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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:

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.

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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 mortar coverage by complying with applicable special requirements for back buttering of tile in referenced ANSI A108 series of tile installation standards:

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- 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.
 - 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

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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.
- B. Test kitchen and storage rooms.

3.14 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.

- - - E N D - - -

**SECTION 09 44 50
EPOXY TERRAZZO FLOORING**

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies epoxy terrazzo flooring (TER) with integral base.
- B. Flooring consists of epoxy resin, aggregate chips, and sealer coat.

1.2 RELATED WORK

- A. Color, finish texture, and location of epoxy terrazzo flooring:
Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULE.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01340, SAMPLES AND SHOP DRAWINGS.
- B. Manufacturer's Literature and Data:
 - 1. Description of product to be provided; technical data showing compliance with specifications.
 - 2. Cleaning and preservative solutions.
 - 3. Terrazzo formula.
 - 4. Stop and divider strips.
 - 5. Application and installation instructions, including proposed deviations from specifications.
- C. Samples:
 - 1. Each color specified in Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULE.
 - 2. Sample 300 mm (12-inch) square in finish and texture to match sample at the Contracting Officer's Representative's Office.
 - 3. Sample showing construction from substrate to finish surface in thickness specified.
- D. Certification and Approval:
 - 1. Manufacturer's certification of material compliance.
 - 2. Manufacturer's approval of installers.
 - 3. Contractor's certificate of compliance with Quality Assurance requirements.

1.4 QUALITY ASSURANCE

- A. Single Source Responsibility.
 - 1. Obtain primary epoxy terrazzo flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials specified.
 - 2. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

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- B. Installer trained and approved by manufacturer of primary material and having completed at least five projects of similar size and complexity.

1.5 MATERIAL PACKAGING DELIVERY AND STORAGE

- A. Deliver materials to the site in original sealed packages or containers, clearly marked with the manufacturer's name or brand, type and color, production run number and date of manufacture.
- B. Protect materials from damage and contamination in storage.
- C. Store materials in clean, dry, temperature controlled location.
- D. Maintain temperature of storage area between 10 and 32 degrees C (50 and 90 degrees F.)
- E. Package materials in factory pre-weighed and in single, easy to manage batches sized for ease of handling and mixing proportions from entire package or packages.

1.6 APPLICABLE PUBLICATIONS

- A. Publication 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):
 - C948-81(2001).....Dry and Wet Bulk density, Water Absorption, and Apparent Porosity of thin Sections of Glass-Fiber Reinforced Concrete
 - D56-05.....Flash Point by Tag Closed Tester
 - D412-06.....Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
 - D638-08.....Tensile Properties of Plastics
 - D695-06.....Compressive Properties of Rigid Plastics
 - D790-07.....Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
 - D2240-05.....Rubber Property - Durometer hardness
- C. The National Terrazzo & Mosaic Association, Inc. (NTMA).
- D. American National Standards Institute (ANSI):
 - A118.9-1999.....Cementitious Backer Units

PART 2 - PRODUCTS**2.1 SYSTEM DESCRIPTION**

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- A. Epoxy terrazzo flooring includes primer, aggregate chips, epoxy resin, clear sealer coat, and divider strips.
- B. System resistant to chemicals and abrasion.

2.2 EPOXY TERRAZZO FLOORING

- A. Epoxy Resin (without aggregate chips added):
 - 1. Physical Properties as follows:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Hardness	ASTM D2240 Shore D	85/65
Tensile Strength (Resin Only)	ASTM D638 run at .2 min. Specimen made using "C" die listed in ASTM D412	3,000 psi
Compressive Strength	ASTM D695, Specimen B cylinder	10,000 psi

- B. Aggregate Chips (Marble, Granite, and Glass):
 - 1. Sizes to meet NTMA gradation standards.
 - 2. Hardness, ASTM C241: Ha-10 minimum.
 - 3. 24 hour absorption rate not to exceed 0.75 percent.
 - 4. Chips shall contain no deleterious or foreign matter.
 - 5. Dust content less than one percent by weight.

2.3 RELATED MATERIALS

- A. Slope and Fill Mortar: Moisture tolerant epoxy mortar underlayment system designed for sloping and filling applications. Material to a product of or approved by the epoxy terrazzo manufacturer. Fill shall have the following minimum properties:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Tensile Strength	ASTM D638	3,500 psi
Compressive Strength	ASTM D695,	8,000 psi
Flexural Strength	ASTM D790	7,000 psi

- B. Crack Suppression Membrane: Flexible epoxy system with fiberglass scrim terrazzo which combines toughness, adhesion, and durability. Material to be a product of or approved by the epoxy manufacturer. Fill shall have the following minimum properties:

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>REQUIREMENTS</u>
Tensile Strength	ASTM D412	1,200 psi
Elongation	ASTM D412	145 percent
Hardness, Shore A	ASTM D2240	23

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- C. Stop and Divider Strips: White zinc alloy type, one piece; flush type stop, zinc-alloy nosing, 24 gauge galvanized steel backing; "L" shape divider strip, 6.0 by 12.5 mm (1/4 by 1/2-inch) angle, 3 mm (1/8-inch) thick top and 1.6 mm (16 gauge) bottom member.

- D. Cementitious Backer Units at Coved Base:

1. ANSI A118.9.
2. Thickness: 1/4 inch unless otherwise indicated.
3. Use cementitious backer units in maximum available lengths.
4. Backer unit meet or exceed the following additional physical properties:

<u>Property</u>	<u>Test Method</u>	<u>Value</u>
Water absorption	ASTM C948	Less than 20 percent by weight

- E. Terrazzo Cleaner:

1. Ph factor between 7 and 10.
2. Biodegradable and phosphate free.
3. Flash Point: ASTM D56, 26.7 degrees C (80 degrees F) minimum

- F. Sealer:

1. Ph factor between 7 and 10.
2. Shall not discolor or amber.
3. Flash Point: ASTM D56, 26.7 degrees C (80 degrees F) minimum.

- G. Primers, Coloring, Sealer, and Cleaner as standard with manufacture of flooring system.

2.4 MIXES

- A. Color: Refer to Section 09050, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULE.
- B. Proportions: Epoxy terrazzo topping mix proportions shall be in accordance with the resin supplier's recommendations.
- C. Mixing Terrazzo Topping: Charge and mix aggregate chips and epoxy resin in accordance with manufacturer's instructions.

PART 3 - EXECUTION**3.1 PROJECT CONDITIONS**

- A. Maintain temperature of materials above 10 degrees C (50 degrees F), for 48 hours before, during, and after installation.
- B. Maintain temperature of rooms where work occurs, between 21 degrees C (70 degrees F) and 32 degrees C (90 degrees F) for at least 48 hours, before, during, and 24 hours after installation. Maintain temperature at least 21 degrees C (70 degrees F) thereafter.
- C. Do not install materials until building is permanently enclosed and wet construction is complete, dry, and cured.
- D. Concrete substrate cured and not less than 30 days old. Concrete substrate shall be level with maximum variation not to exceed 6 mm (1/4-inch) in 3 m (10 feet).

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- E. Area free of other trades during and for a period of 24 hours after installation.

3.2 PREPARATION

- A. Clean and prepare substrate to comply with NTMA requirements.
- B. Verify that no admixtures or curing agents have been used on subfloor which will adversely affect resinous terrazzo flooring.
- C. Do not install resinous terrazzo flooring until conditions are satisfactory.
- D. Remove any grease, dirt, paint, concrete, laitance, or other materials which will prevent proper adhesion of matrix to base surface by solvent wiping, scrubbing with detergent and rinsing, acid etching, scarifying, sandblasting, or other suitable means. Allow surface to dry completely prior to application of topping.
- E. Install slope and fill mortar in accordance with manufacturer's instruction to produce smooth surface to receive terrazzo and to create required slopes.
- F. Install crack suppression membrane in accordance with manufacturer's instructions over cured slope and fill mortar.
- G. Divider Strips: Install divider strips as shown on drawings. Install divider strips and accessory strips in adhesive setting bed, in accordance with manufacturer's instruction, without voids below strips
- H. Broom clean area to receive epoxy terrazzo of loose chips, laitance and all foreign matter.
- I. Do not start work until all defects have been corrected.

3.3 APPLICATION

- A. After mixing, trowel on component materials to reasonably uniform thickness of not less than 1/4 inch nor more than 3/8 inch in accordance with manufacturer's specifications and requirements of NTMA "Guide Specification for Epoxy Terrazzo".
- B. Provide epoxy terrazzo flooring without interruptions of seams, except where divider strips, control joints, and expansion joints where indicated
- C. Turn flooring up for cove base at vertical wall surfaces and penetrations. Cove joint with floor; 25 mm (1-inch) radius. Round interior and external corners.
- D. Finishing:
 - 1. Delay grinding and finishing until heavy trade work is completed and construction traffic through area is restricted.
 - 2. Rough Grinding:
 - a. Grind with 24 or finer grit stones or with comparable diamond plates.
 - b. Follow initial grind with 80 or finer grit stones.

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3. Grouting:
 - a. Cleanse floor with clean water and rinse.
 - b. Remove excess rinse water, dry and apply epoxy grout, supplied by epoxy manufacturer, to fill voids.
4. Cure Grout.
5. Fine Grinding:
 - a. Grind with 80 or finer grit stones until all grout is removed from surface.
 - b. Upon completion, terrazzo shall show a minimum of 70 percent marble chips.
6. Grind cove as required at door frame transitions.

3.4 CLEANING AND SEALING

- A. Clean epoxy terrazzo flooring after installing and finishing operations are completed, comply with cleaner a manufacturer's published instructions.
- B. Apply sealer to cleaned epoxy terrazzo surfaces in accordance with sealer manufacturer's published instructions.
- C. Final Cleaning: Clean resinous matrix terrazzo flooring as recommended by sealer manufacturer and machine buff if required when building is ready for occupancy.

3.5 PROTECTION

- A. Upon completion, the work shall be ready for final inspection and acceptance by the Government.
- B. Protect epoxy terrazzo flooring surfaces from damage and wear until Substantial Completion.

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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. 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, 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.
- B. Anchorage to Structure:
 - 1. Concrete:

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- 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.
 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.

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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 54 26**LINEAR WOOD CEILINGS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section Includes:
 - 1. Suspended metal grid ceiling system including trim.
 - 2. Decorative, wood grille ceiling panels for concealed ceiling suspension system.
 - 3. Trims and accessories.
- B. Unit size, texture, finish, and color as specified.
- C. Location and extent of acoustical treatment as shown.

1.2 RELATED WORK

- A. Batt, Blanket and Sound Isolation Insulation: Section 07 21 13, THERMAL INSULATION.
- B. Finish Color: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Acoustical Ceilings: Section 09 51 00, ACOUSTICAL CEILINGS.
- D. Sprinkler System: Section 21 13 13, WET-PIPE SPRINKLER SYSTEMS.
- E. Air Outlets and Inlets: Division 22, PLUMBING.
- F. Interior Lighting: Section 26 51 00, INTERIOR LIGHTING.

1.3 QUALITY CONTROL

- A. Qualifications:
 - 1. Approval required of products or service of proposed manufacturer, suppliers and installers, and shall be based upon submission by Contractor of certification that:
 - a. Manufacturer regularly and presently, manufactures and installs linear wood ceiling systems and related accessories as one of its principal products and has a record of successful in-service performance.
 - b. Accessories required for linear wood ceiling systems shall be manufacturer's standard or other systems compatible with linear metal ceiling system manufacturer's material. Items shall be of materials and construction which shall provide desired functional service.
 - 2. Installer: Approved in writing by manufacturer.

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- B. Coordination of Work: Coordinate layout and installation of linear wood ceiling units and suspension system components with other work supported by, or penetrating through, ceilings, including light fixtures, HVAC equipment, fire-suppression system components (if any), and partition system (if any):
 - 1. Sprinkler heads and light fixtures: Shall typically penetrate center of a panel width.
 - 2. HVAC Air Outlets and Inlets: Shall be planned to occur within center of panel systems or provide for equal distance on each side parallel to length of panels
- C. Seismic Design:
 - 1. Design suspension system for seismic considerations under direct supervision of Professional Structural Engineer experienced in design of this work and licensed in state of California.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Product Data:
 - 1. Manufacturer's standard details and fabrication methods.
 - 2. Data on finishing, hardware, components, and accessories.
 - 3. Recommendations for maintenance and cleaning of finish surfaces.
- C. Shop Drawings:
 - 1. Submit complete composite fabrication, and installation shop drawings including associated components.
 - 2. Identify panel sections, edge trim, lighting trim, air diffuser sections and trim, sprinkler head locations and trim, other component parts, not included in manufacturer's product data, by name and material and showing design, construction, installation, and anchorage.
 - 3. Layout and installation details, including relation to adjacent work such as walls and bulkheads.
 - 4. Composite reflected ceiling plans, at 1:50 (1/4 inch) scale, showing location of all accessories, mechanical and electrical components. Indicate following:
 - a. Joint pattern.
 - b. Ceiling suspension members.
 - c. Method of attaching hangers to building structure.
 - d. Ceiling-mounted items including light fixtures, air outlets and inlets, speakers, sprinkler heads, and access panels. Special moldings at walls, column penetrations, and other junctures with adjoining construction.

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5. Detail sections of typical composite members, at wall surfaces, mechanical diffusers and grilles, sprinkler heads, and light fixtures.
6. Provisions for expansion and contraction.
7. Anchors and reinforcements.
8. Perimeter moldings

D. Samples:

1. Submit pairs of samples of each specified color and finish on 300 mm (12 inch) long sections for following:
 - a. Linear wood panel.
 - b. Suspension system members.
 - c. Insulation.
 - d. Accessories.
2. Where normal color variations are anticipated, include 2 units in set indicating extreme limits of color variations.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Materials: Deliver to site in manufacturer's original unopened containers with brand name and type clearly marked.
- B. Materials: Carefully handle and store in dry, watertight enclosures.
- C. Immediately before installation, linear metal ceiling units shall be stored for not less than 48 hours at same temperature and relative humidity as space where they will be installed to assure temperature and moisture conditions in accordance with manufacturer's recommendations.

1.6 APPLICABLE PUBLICATIONS

- A. Publications listed below form a part of this specification to extent referenced. Publications are referred to in text by basic designation only.
- B. American Architectural Manufacturers Association (AAMA):
 1. AAMA 605-98 High Performance Organic Coatings on Architectural Extrusions and Panels.
- C. American Society for Testing and Materials (ASTM):
 1. A641/641M-03 Zinc-coated (Galvanized) Carbon Steel Wire.
 2. A653/A653M-07 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 3. B209/B209M-07 Aluminum and Aluminum-Alloy Sheet and Plate.
 4. C635-07 Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
 5. C636-06 Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

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6. E90-04 Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
7. E580-06 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.

D. National Association of Architectural Metal Manufacturers (NAAMM): Metal Finishes Manual (1988)

1.7 ENVIRONMENTAL REQUIREMENTS

1. Uniform temperature of not less than 16 °C, (60 °F) nor more than 27 °C, (80 °F) and a relative humidity of not more than 70 percent shall be maintained for a period of 48 hours before, during, and for 48 hours after installation of linear metal ceiling units. After above period, room temperature shall not fall below 13 °C (55 °F).

1.8 SCHEDULING

1. Interior finish work such as plastering, gypsum board finishing, painting, concrete and terrazzo work shall be complete and dry before installation. Mechanical, electrical, and other work above ceiling line shall be completed and heating, ventilating, and air conditioning systems shall be installed and operating in order to maintain temperature and humidity requirements.

1.9 WARRANTY

1. Submit written warranty, in accordance with FAR clause 52.246-21, Warranty of Construction requirements except that warranty period shall be extended to two (2) years.

PART 2 - PRODUCTS

2.1 LINEAR WOOD CEILING PANELS

- A. Linear wood ceiling panels installed at suspended ceiling metal grid.
 1. Linear Wood Ceiling Panels:
 - a. Type LWC1: See Section 090600 for information on ceiling dimensions and type
 2. Fire Rating: Class A.
 3. Reveal Scrim: Black reveal scrim.

2.2 METAL SUSPENSION SYSTEM

- A. Suspension Systems,: See Section 090600 for additional information on Suspension system
 1. Metal Suspension Systems: Heavy duty 15/16 inch main runners, cross-tees and wall angles complying with ASTM C635.

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- B. Wire for Carriers, Hangers, and Ties: ASTM A641/A641m, Class 1, zinc coating, soft temper.
 - 1. Gage: Minimum 12 gage. Shall support a minimum of 1330 N, (300 pounds ultimate vertical load without failure of supporting material or attachment.
- C. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated, or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 22 mm (7/8 inch) wide, formed with 0.82 mm (0.0365 inch) galvanized steel sheet complying with ASTM A653/A653m, Coating Designation G90, with bolted connections and 7.6 mm (5/16 inch) diameter bolts.
- F. Extruded Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's seismic design requirements.
- G. Carriers: Comply with ASTM A653/A653m, cold-rolled, electro-galvanized, 0.375 mm (0.0209 inch) (25 gage) minimum nominal thickness steel

2.3 SOUND INSULATION

- A. Rigid, resin bonded, glass fiber-board insulation with flame-retardant black mat facing.
- B. 2. Thickness: 2 in.
- C. 3. Sound Absorption Coefficient: NRC 1.00
- D. 4. Density: 3.0 pcf
- E. 5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

PART 3 - EXECUTION**3.1 PREPARATION**

- 1. Measure each ceiling area and establish layout of linear wood panel units to balance border widths at opposite edges of each ceiling.

3.2 INSTALLATION

- A. Standard for Installation of Ceiling Suspension Systems: Comply with manufacturers printed installation instructions.
- B. Suspend ceiling hangers from building structural members and as follows:

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1. Install hangers plumb, free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers where required to avoid obstructions and offset resulting horizontal forces by bracing, counter splaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 3. Secure hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for structure to which hangers are attached as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail because of age, corrosion, and elevated temperatures.
 4. Space hangers not more than 1200 mm (48 inches) on center along each member supported directly from hangers, unless otherwise shown.
- C. Scribe and cut wood panel units for accurate fit at borders and at interruptions and penetrations by other work through ceilings.
- D. Align joints in adjacent courses to form uniform, straight joints parallel to room axis in both directions, unless otherwise-shown.
- E. Install acoustical insulation blankets at right angle to panels so that they do not hang unsupported.

3.3 CLEANING

1. Following installation, dirty or discolored surfaces of linear metal ceiling units shall be cleaned, in accordance with manufacturer's written recommendations, and left free from defects. Units that are damaged or improperly installed shall be removed and new units provided as directed.

3.4 PROTECTION

1. Protect linear metal ceiling systems from damage until final inspection and acceptance.

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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 and resilient stair treads with sheet rubber flooring on landings.

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 and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. 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. Resilient Stair Treads: 150 mm (6 inches) long.
 - 3. Sheet Rubber Flooring: 300 mm (12 inches) square.
 - 4. 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.

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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.

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 RESILIENT TREADS

- A. Fed. Spec. RR-T-650, Composition A, Type 2, 5 mm (3/16 inch) thick on wear surface tapering to 3 mm (1/8 inch) thick at riser end.
- B. Nosing shape to conform to sub-tread nosing shape.

2.4 SHEET RUBBER FLOORING

- A. ASTM F1344, F1859 or F1860, 900 mm (36 inches) wide, 3 mm (1/8 inch) thick, smooth face, material by the same manufacturer as the rubber treads, color and pattern to match treads.

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- B. Use for stair landings.
- C. Use rubber flooring made with a minimum of 90% consumer rubber where possible.

2.5 PRIMER (FOR CONCRETE FLOORS)

- A. As recommended by the adhesive and tile manufacturer.

2.6 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Provide products with latex or polyvinyl acetate resins in the mix.

2.7 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.
- 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 VA COR.
- B. Submit proposed installation deviation from this specification to the VA COR indicating the differences in the method of installation.
- C. The VA COR 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.

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- D. Do not use adhesive for leveling or filling.
- E. Grind, sand, or cut away protrusions; grind high spots.
- F. Clean substrate area of oil, grease, dust, paint, and deleterious substances.
- G. Substrate area dry and cured. Perform manufacturer's recommended bond and moisture test.
- H. Preparation of existing installation:
 - 1. Remove existing base and stair treads 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.
 - 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 STAIR TREAD INSTALLATION

- A. Prepare surfaces to receive the treads in accordance with applicable portions of paragraph, PREPARATION.
- B. Layout of Treads.
 - 1. No joints will be accepted in treads.,

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2. Set full treads on intermediate and floor landings.

C. Application:

1. Apply adhesive uniformly with no bare spots.
2. Roll and pound treads to assure adhesion.

3.6 SHEET RUBBER INSTALLATION.

- A. Prepare surfaces to receive sheet rubber in accordance with applicable portions of paragraph, PREPARATION.

B. Layout of Sheet Rubber:

1. Use minimum number of joints compatible with material direction and symmetrical joint location.
2. Where sheet rubber intersect vertical stair members, other sheets, stair treads, and other resilient materials at the floor landings, material shall touch for the entire length within 5 mils (0.005 inch).
3. Install sheet rubber on floors and intermediate landings where resilient stair treads are installed; center joint with other flooring material under doors.

C. Application:

1. Apply adhesive uniformly with no bare spots.
2. Roll sheet rubber to assure adhesion.

3.7 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 VA COR.

- 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.

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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.

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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. Grades of resilient sheet vinyl floor covering without backing having vinyl plastic wear layer with backing.
- 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. 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. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- D. Color, pattern and texture: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. 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'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 vinyl floor coverings shall meet fire performance characteristics

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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. Critical Radiant Flux: 0.45 watts per sq. cm or more, Class I, per ASTM E648.
 2. Smoke Density: Less than 450 per ASTM E662.
- 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 of floor materials and room, where work occurs, above 18 deg C (65 deg F) and below 38 deg C (100 deg F) for 48 hours before, during and for 48 hours after installation. After above period, room temperature shall not fall below 13 deg C (55 deg F).
- 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.

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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 vinyl 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. E648-09 Critical Radiant Flux of Floor-Covering Systems Using a Radiant Energy Source.
 - 2. E662-09 Specific Optical Density of Smoke Generated by Solid Materials.
 - 3. F710-08 Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 - 4. F1303-04 Sheet Vinyl Floor Covering with Backing.
 - 5. F1869-04 Moisture Vapor Emission Rate of Concrete Subfloor using Anhydrous Calcium Chloride
 - 6. F1913-04 Sheet Vinyl Flooring without Backing
 - 7. F2170-09 Determining Relative Humidity in Concrete Floor Slabs using In-situ Probes
- C. Resilient Floor Covering Institute (RFCI):
 - 1. Recommended Work Practices for Removal of Resilient Floor Coverings.

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.

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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 SHEET VINYL FLOOR COVERINGS**

- A. Sheet Vinyl Floor Coverings: Smooth face, minimum thickness nominal
- B. 2 mm (0.08 inch). Sheet flooring shall conform to ASTM F1913 and material requirements specified in ASTM F1303, Type II, Grade 1, backing classification not applicable. Foam backed sheet flooring is not acceptable.
- C. Size: Provide maximum size sheet vinyl material produced by manufacturer to provide minimum number of joints. Minimum size width acceptable - 1200 mm - 1800 mm (48 - 72 inches).
- D. 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 SHEET FLOORING

- A. ASTM F1303, Type II, Grade 1, except for backing requirements. Foam backed sheet flooring is not acceptable.
- B. Minimum nominal thickness 2 mm (0.08 inch); 1800 mm (72") minimum width.
- C. Critical Radiant Flux: 0.45 watts per sq.cm or more, Class I, per ASTM E648.
- D. Smoke density: less than 450 per ASTM E662.
- E. Color and pattern of sheet flooring of the same production run.

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2.5 ADHESIVES

- A. Water resistant type recommended by the sheet flooring manufacturer for the conditions of use. VOC not to exceed 50g/L.

2.6 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.

2.7 LEVELING COMPOUND (FOR CONCRETE FLOORS)

- A. Provide cementitious products with latex or polyvinyl acetate resins in the mix.

2.8 PRIMER (FOR CONCRETE SUBFLOORS)

- A. As recommended by the adhesive or sheet flooring manufacturer.

2.9 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.

2.10 SEALANT

- A. As specified in Section 07 92 00, JOINT SEALANTS.
- B. Compatible with 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.

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- 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, 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.

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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.
- 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 vinyl 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. Match edges of resilient floor coverings for color shading and pattern at seams.
- E. Where resilient sheet flooring abuts other flooring material floors shall finish level.
- F. Extend sheet vinyl floor coverings into toe spaces, door reveals, closets, and similar openings.
- G. 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.
- H. 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.
- I. Keep joints to a minimum; avoid small filler pieces or strips.
- J. Follow manufacturer's recommendations for seams at butt joints. Do not leave any open joints that would be readily visible from a standing position.

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- K. Follow manufacturer's recommendations regarding pattern match, if applicable.
- L. 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.
- M. Integral Cove Base Installation:
 - 1. Set preformed fillet strip to receive base.
 - 2. Install the base with adhesive, terminate exposed 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 COVERED 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.

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

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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.

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.

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SECTION 09 66 16
TERRAZZO FLOOR TILE (BID ALTERNATE #8)

PART 1 - GENERAL

1.1 DESCRIPTION

Resilient terrazzo tile for installation over concrete floors.

1.2 RELATED WORK

- A. Resilient Base: Section 09 65 13, RESILIENT BASE AND ACCESSORIES.
- B. Concrete floors: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- C. Wood Subfloors: Section 06 10 00, ROUGH CARPENTRY.
- D. Color and Pattern: Section 09 06 00, SCHEDULE FOR FINISHES.

1.3 MANUFACTURER'S QUALIFICATIONS

- A. Approval by Contracting Officer is required of products or service, or proposed manufacturer, suppliers and installers, and will be based upon submission by Contractor of certification that:
 - 1. Manufacturer regularly and presently manufactures terrazzo tile as one of his principal products.
 - 2. Installer has technical qualifications, experience, trained personnel and facilities to install specified items. Approval will not be given, however, where experience record is one of unsatisfactory performance.
 - 3. 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. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, furnish the following:
- B. Flooring Manufacturer's Literature and Data: Printed pre-installation and installation instructions for conditions indicated.
- C. Certificates: Indicating materials conform to specified requirements. Indicating flooring manufacturer's approval of underlayment, substrate preparation, adhesive finishes and cleaners.

- D. Samples: Terrazzo Tile (12"x12" tile each color and pattern to be used)
adhesive rubber cove base, each color, 150 mm (6 inch) length

1.5 DELIVERY

Deliver materials to job in manufacturer's original unopened containers, free of damage, with manufacturer's brand name marked thereon. Tile must be protected from damage by other trades

1.6 STORAGE

Store materials in a protected area indoors in a climate controlled environment, sheltered from moisture and in the original packaging.. Storage area shall be kept dry and temperature of storage area shall not be lower than 18 degrees C (65 degrees F) or higher than 27 degrees C (80 degrees F).

1.7 PROJECT CONDITIONS

Tiles shall not be installed until all other work that could cause damage to the finish flooring has been completed. Maintain a temperature of not less than 21 degrees C (70 degrees F) in spaces where tile is to be installed for at least 48 hours before, during and after the laying of tiles. Bring tile into such spaces and allow it to condition at not less than 21 degrees C (70 degrees F) at least 48 hours before installing. A minimum temperature of 13 degrees C (55 degrees F) shall be maintained thereafter.

1.8 WARRANTY

Terrazzo tile is subject to terms of "Warranty of Construction" FAR clause 52.246-21, except that warranty period is two years in lieu of one year.

1.9 APPLICABLE PUBLICATIONS

- a) American Society for Testing and Materials (ASTM)
 - i) ASTM C-33
 - ii) ASTM C-140
 - iii) ASTM C-150
 - iv) ASTM C-293
 - v) ASTM C-373

- vi) ASTM C-482
- vii) ASTM C-485
- viii) ASTM C-499
- ix) ASTM C-502
- x) ASTM C-609
- xi) ASTM C-648
- xii) ASTM C-650
- xiii) ASTM C-674
- xiv) ASTM C-1243
- xv) ASTM C-1378
- xvi) ASTM D-523
- xvii) ASTM A137.1 section 9.6
- b) American National Standards Institute (ANSI)
 - i) ANSI A108.1 thru A108.17
 - ii) ANSI A118.1 thru A118.15
- c) National Terrazzo and Mosaic Association (NTMA)
- d) Tile Council of North America (TCNA) Handbook - latest edition

1.10 QUALITY ASSURANCE

- a) Setting and Grouting Materials: Provide materials obtained from one source for each type and color of grout and setting materials.
- b) NTMA Standards: Comply with specified provisions and recommendations of NTMA
- c) TCNA Standards: Comply with specifications under the current Handbook for Tile Installation
- d) Manufacturer to supply written Terrazzo Tile Protocol, upon request.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portland Cement: ASTM C-150 specifications for Portland Cement
- B. Aggregates: All aggregates to meet ASTM C-33 specifications
The aggregates used should have a natural color range and come in a variety of sizes and colors. Therefore the aesthetic class/shade range as per ASTM test C609 will vary from a V1 rating to a V2 rating.
- C. Coloring: Pigments used shall be inorganic, resistant to alkalinity, and used per manufacturer's recommendations.
- D. Color Blending: The aggregates used should have a natural color range.
This can cause slight variances in overall color. Tiles should be

blended at the job site from several cartons/pallets during installation.

- E. Applied Initial Protectant: Apply Scotchgard™ Stone Floor Protector to the terrazzo tile prior to packaging.
- F. Chamfered edges
- G. Surfaces to be uniform in appearance and free of blemishes
- H. Expansion Joint Materials:
 - a. Polyurethane Sealant backed by 16-gauge angles
- I. Sealing and Polishing Materials: Thin Terrazzo Tile are not factory sealed. After the field polishing of the tile is complete the tile need to be sealed. Apply the final seal using a product compatible with cement terrazzo and following the sealer manufacturer's instructions

2.2 FABRICATION

- a) Mechanically vibrated in molds
- b) Hydraulically pressed by 900-ton/3250 psi press
- c) Steam-cured with 100 percent humidity for 12 hours at 170 degrees F
- d) Factory finish: In-line back and face grinding
- e) Factory applied initial protectant
- f) Packaged and palletized

2.3 WALL BASE

See Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

2.4 METAL EDGE STRIPS

Extruded aluminum, butt-type, approximately 38 mm (1-1/2 inches) wide with thickness to set top surface flush with top of tile and with bevel at exposed edge. Edge strips shall have countersunk holes, near each end and spaced at no more than 300 mm (8 inches) on center for securement.

PART 3 - EXECUTION

3.1 GENERAL

Provide flooring and base on floor surfaces and walls where shown on the drawings. Provide resilient base as scheduled for room or space, for freestanding columns, pilasters, furred spaces convectors and where shown. Resilient base required over metal base of casework is specified

in other sections. Except as necessary to install new tile, keep all traffic off new tile for at least 24 hours after installation.

3.2 SUBSTRATE PREPARATION

- A. The following work should be complete and approved before installation of terrazzo is begun:
1. Surface to receive terrazzo tile shall be plumb, level, and true with square corners, maximum variation from required plane shall be 1/8" in 10 feet.
 2. Apply Self-Leveling Underlayment to concrete floors where determined by architect in conjunction with the terrazzo tile contractor. Leveling coat shall be compatible with the setting mortar.
 3. Before setting, ensure surfaces are free from coatings, curing membranes, oil, grease, wax, or dust.
 4. All anchors, outlets and other inserts must be in place.
 5. Report all unacceptable surfaces to architect; do not set until surface areas are corrected.
 6. Locate and determine expansion joints based on building control joints, cold joints, sawed joints, and recommend expansion joints based on TCA specifications current issue of EJ 171.

3.3 MOISTURE TEST

Perform Moisture Vapor Emissions testing per ASTM F1869-11 with maximum allowable readings to meet manufactures recommended limits for approved adhesives. Perform Relative Humidity (RH) test per ASTM F2170-11 using situ probes with allowable reading to meet manufactures recommended limits for approved adhesives. Concrete floors must be tested for pH levels. A neutral pH level of above 7 and below 10 are required. After concrete floor surfaces have been cleaned, spread small patches of adhesive to be used, in several locations in each room and allow to dry overnight. If the adhesive can be peeled easily from the floor surfaces, the floor is not sufficiently dry. The test shall be repeated until the adhesive adheres properly. Lay tile flooring when the adhesive adheres tightly to the subfloor.

3.4 INSTALLATION

- A. Install tile in accordance with the tile manufacturer's approved installation instructions, except as specified herein.
- B. Installation shall comply with the appropriate Installation Method as depicted in the current edition of the Tile Council of North America Handbook for Ceramic, Glass, and Stone Tile Installation. The architect or other design professional shall select which method to be specified. All specifications must also conform to local codes, ordinances, trade practices, and climatic conditions
- C. A minimum of 95 percent thin-set coverage is recommended on the back of the terrazzo tile. The corners of the tile must have good mortar support to prevent cracking. Back buttering is recommended to reach these requirements.
- D. All work should be performed by trade contractors, tile and marble setters, and finishers who are thoroughly competent to execute the work and have had successful experience with projects of similar magnitude to this project.
- E. Follow all current TCA/NTMA guidelines and ANSI A108-1B.
- F. Appropriate ANSI A-108 installation specifications that correspond with the selected TCNA Installation Method are to be followed. This includes Substrate and Surfaces inspections, Location and Frequency of EJ171 Movement Joint Guidelines, Placement Techniques, and Grouting Procedures.
 - 1. Minimum recommended grout joint width is 1/8"
 - 2. Layout to be designed without precast terrazzo smaller than half-size.
 - 3. Junctions: Areas that meet other flooring to require metal divider strips of 16 gauge metal angle
 - 4. Control joints are required:
 - i. Over all structural expansion joints, follow TCA spec EJ 171
 - ii. Every 24 to 36 lineal feet and at all corridor intersections
 - iii. All perimeter edges to have soft joints
 - iv. Architect to determine final locations of all control joints
- G. Metal Edge Strips: Secure strips with No. 10 aluminum alloy, counter sunk flathead machine screws with expansion sleeves.
- H. Premolded Base: Install as specified in Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

3.5 CLEANING

Upon completion of the installation, and after adhesive has cured,
clean flooring in accordance with manufacturer's recommendations.

3.6 PROTECTION

From the time of laying until acceptance, protect the flooring from
damage. Replace damaged, loose, broken, or curled tiles.

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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. 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 and texture of carpet and edge strip: Section 09 06 00, SCHEDULE FOR FINISHES.
- D. 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)

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of carpets, showing quality, pattern and color specified in Section 09 06 00, SCHEDULE FOR FINISHES.

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):

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1. AATCC 16-04 Colorfastness to Light
 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: 45.72 cm x 91.44 cm (18 x 36 inches) 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: CPT-1 (laser cut): 3.25 mm, CPT-2 (overlay): 3.23 mm
 5. Tufted Weight: 813.74 g.m² (24.0)
 6. Pile Fiber: Nylon with recycled content 25 percent minimum branded (federally registered trademark).
 7. Pile Type: multi-level pattern Loop.
 8. Backing materials: Manufacturer's unitary backing designed for glue-down installation using recovered materials.
 9. Appearance Retention Rating (ARR): Carpet shall be tested and have the minimum 3.5-4.0 Severe ARR when tested in accordance with either

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- 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.
10. Tuft Bind: Minimum force of 40 N (10 lb) required to pull a tuft or loop free from carpet backing. Test per ASTM D1335.
 11. Colorfastness to Crocking: Dry and wet crocking and water bleed, comply with AATCC 165 Color Transference Chart for colors, class 1 rating only.
 12. Colorfastness to Ozone: Comply with AATCC 129, minimum rating of 4 on the AATCC color transfer chart.
 13. Delamination Strength: Minimum of 440 N/m (2.5 lb/inch) between secondary backing.
 14. 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. Carpet in corridors, exits and Medical Facilities: Class I.
 15. 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.
 16. 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

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than 16 mm (5/8 inch) wide.

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.

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1. Relax carpet in accordance with Section 6.4.
 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. 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.

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.

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- 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 reception desk at main Emergency Department lobby. Includes back-routed and infilled text "EMERGENCY" in panel.

1.03 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 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.
 - 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

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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. Back engraved in Helvetica 55 Roman font as per drawings. Infilled with Palette White.
 - c. Protective 10ml backer
 - d. 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: Resin Panels at Reception Desk with vertical face panels attached on four point stand-offs as detailed in drawings.
 - a. ½" acrylic panels size and shape as shown on drawings
 - b. Panels to be cut to size by manufacturer and fabricated by manufacturer as necessary.
 - c. Panel edges to be CNC edge finish
 - d. Fabricate in accordance with manufacturer's recommendations.

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2.02 MISCELLANEOUS

1. Installation method with perimeter channel.
2. Provide 8" etched text or as indicated on the drawings.
3. MAINTENANCE: Follow manufacturers' recommendations and guidelines

PART 3 - INSTALLATION**3.01 INSPECTION**

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**PLASTIC LAMINATE WALL PANEL SYSTEM (WPS DEDUCT ALTERNATE #5)****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 013323: Shop Drawings, Product Data and Samples
 - 2. Section 017419: Construction Waste Management
 - 3. Section 01811: Sustainability
 - 4. Section 090600: Finishes
 - 5. Section 097750: Solid polymer wall panels.
 - 6. Section 097762: Plastic laminate wall panel system PWP2.

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 Architect. 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 1/4", 5/16", 3/8" & 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 Section 09 06 00.
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 09 77 50
WOOD VENEER WALL PANEL SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This section specifies the requirements for wood paneled walls (WDP).

1.2 RELATED WORK

- A. Wood veneer: Section 090600, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SAMPLES AND SHOP DRAWINGS.
- B. Samples: Wood veneer in quadruplicate, as specified in 090600, INTERIOR/EXTERIOR FINISHES, MATERIALS, AND FINISH SCHEDULES, size 200 mm (1/4 yard).
- C. Manufacturer's Literature and Data: Complete instructions for installation of wall panels.

1.4 QUALITY ASSURANCE

- A. Installer: Firm with minimum five years successful experience in projects of similar type and scope; acceptable to manufacturer of acoustical metal wall panel system.

1.5 SITE CONDITIONS

- A. Do not install metal panels until dust generating activities have terminated and overhead mechanical work is completed, tested and approved.
- B. Permit wet work to dry prior to commencement of installation.

PART 2 - PRODUCTS

2.1 BASIS-OF-DESIGN

- A. Basis-Of-Design Products: The design of wood paneled walls is based on product specified in this Section. Subject to compliance with requirements, provide named product or a comparable product.

2.2 WOOD PANELED WALL SYSTEMS

A. WV-1 Wood Veneer Wall Panel

Description:

1. Aluminum panels with honeycomb backing
2. Panel Size: As indicated on Drawings.
3. Panel Layers:
 - a. Aluminum honeycomb with a thickness of 1/2" cell size of 1/4" medium density of 83.3kg/m³ (5.2 lb/ft³)
 - b. Top layer: aluminum 1/32" (0,8mm) (AIMg 3)
 - c. Back layer: aluminum 1/32" (0,8mm) (AIMg 3)
 - d. Aluminum clips for direct mounting to substrate.
4. Surface finish: Real wood veneer finish, as per Section 09 06 00
6. Edges:
 - a. Sharp panel edges
 - b. Panels to be edge banded. Pan in pan construction will not be acceptable.

B. WVMB Wood Veneer Wall Panel Base

1. At all locations where WV-1 is specified, base to be 14 Ga 304, #4 Stainless Steel, Non welded corners.

C. DWP-1 Decorative Wood Veneer Wall Panel

Description:

1. Framed bentwood decorative acoustical wall panel with baffles
2. Material: Birch frame and bentwood slats.
3. Acoustical backing made from polyester fiber.
4. Thickness: 3 1/8 inches
5. Height 23 1/2 inches
6. Width: 47 1/4 inches

2.3 FASTENERS

- A. Attachment: Concealed "Z-clip" system; size and type to suit application and to rigidly secure panel system.
- B. Edge Molding: None; furnish panels with finished corners and edges.
- C. Accessories: Provide as recommended by system manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Take field measurements prior to fabrication of panels.
- B. Coordinate with other work which requires penetrations through panels.
- C. Ensure wall surfaces to receive panels are clean, true and free of irregularities.
- D. 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. Install acoustical metal wall panel system in accordance with manufacturer's recommendations to maintain lines and levels and to be free from warped, soiled, and damaged panels.
- B. Attach clip system in accordance with panel manufacturer's recommendations and installation instructions.
- C. Apply panels level and true.

3.3 CLEANING

- A. Clean panels. Remove debris and leave areas neat and clean.
- B. Replace damaged and defective panels
- A. Apply panels using concealed mounting, bolted to wall surfaces in accordance with the manufacturer's installation instructions.
- B. Locate panels as shown.

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. 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. 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.
- D. Contractor option: Prefinished flush doors with transparent finishes: Section 08 14 00, WOOD DOORS.
- E. 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

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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.

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.

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- B. In addition to manufacturer's label, provide a label legibly printed as following:
 - 1. Federal Specification Number, where applicable, and name of material.
 - 2. Surface upon which material is to be applied.
 - 3. 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

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3. 48-07 Interior Alkyd, Gloss, MPI Gloss Level 6 (AK)
4. 101-07 Epoxy Anti-Corrosive Metal Primer
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.

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- 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
- 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.

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PART 3 - EXECUTION**3.1 JOB CONDITIONS**

- A. Safety: Observe required safety regulations and manufacturer's warning and instructions for storage, handling and application of painting materials.
 - 1. Take necessary precautions to protect personnel and property from hazards due to falls, injuries, toxic fumes, fire, explosion, or other harm.
 - 2. Deposit soiled cleaning rags and waste materials in metal containers approved for that purpose. Dispose of such items off the site at end of each 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

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or finish is different.

3. See other sections of specifications for specified surface conditions and prime coat.
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

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beads.

4. Spot prime abraded and damaged areas in shop prime coat which expose bare metal with same type of paint used for prime coat. Feather edge of spot prime to produce smooth finish coat.
5. Spot prime abraded and damaged areas which expose bare metal of factory finished items with paint as recommended by manufacturer of item.

E. Zinc-Coated (Galvanized) Metal, Surfaces Specified Painted:

1. Clean surfaces to remove grease, oil and other deterrents to paint adhesion in accordance with SSPC-SP 1 (Solvent Cleaning).
2. Spot coat abraded and damaged areas of zinc-coating which expose base metal on hot-dip zinc-coated items with MPI 18 (Organic Zinc Rich Coating). Prime or spot prime with MPI 134 (Waterborne Galvanized Primer) or MPI 135 (Non-Cementitious Galvanized Primer) depending on finish coat compatibility.

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. 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 Board:

1. Remove efflorescence, loose and chalking plaster or finishing materials.
2. Remove dust, dirt, and other deterrents to paint adhesion.
3. Fill holes, cracks, and other depressions with CID-A-A-1272A finished flush with adjacent surface, with texture to match texture of adjacent surface. Patch holes over 25 mm (1-inch) in diameter as specified in Section for plaster or gypsum board.

3.3 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 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

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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.
- 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.

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- D. Prime rebates for stop and face glazing of wood, and for face glazing of steel.

3.6 EXTERIOR PAINTGIN SCHEDULE

- A. Apply following finish coats where specified in Section 09 06 00, SCHEDULE FOR FINISHES.

- B. Steel and ferrous metal substrates:

- 1. Water-Based Light Industrial Coating System:

- a. Prime Coat (Shop Primer): Epoxy-modified Latex Primer (MPI #301) or Epoxy Anti-corrosive Metal Primer (MPI #101).
 - b. Prime Coat: Epoxy-modified Latex Primer (MPI #301).
 - c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - d. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Light industrial coating, exterior, water based, Gloss Level 3 (MPI #161).
 - 2) Light industrial coating, exterior, water based, semi-gloss, Gloss Level 5 (MPI #163).

- C. Galvanized-metal substrates:

- 1. Water-Based Light Industrial Coating System:

- a. Prime Coat (Shop Primer): Epoxy-modified Latex Primer (MPI #301) or Epoxy Anti-corrosive Metal Primer (MPI #101).
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Light industrial coating, exterior, water based, Gloss Level 3 (MPI #161).
 - 2) Light industrial coating, exterior, water based, semi-gloss, Gloss Level 5 (MPI #163).

- D. Stainless-steel sheet and aluminum metal flashing:

- 1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Waterborne Galvanized Primer (MPI #134).
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss, Gloss Level 5 (MPI #163).

- E. Machinery without factory finish except for primer:

- 1. Water-Based Light Industrial Coating System:

- a. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.

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3.7 INTERIOR PAINTING SCHEDULE

- A. Apply following finish coats over prime coats in spaces or on surfaces specified in Section 09 06 00, SCHEDULE FOR FINISHES.
- B. Concrete substrates, non-traffic surfaces:
 - 1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior (MPI #50).
 - b. Prime Coat: Latex, interior, matching topcoat.
 - c. Intermediate Coat: Latex, interior, matching topcoat.
 - d. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Latex, interior, flat, Gloss Level (MPI #53).
 - 2) Topcoat: Latex, interior, Gloss Level 3 (MPI #52).
 - 3) Topcoat: Latex, interior, semi-gloss, Gloss Level 5 (MPI #54).
- C. Concrete Substrates, Traffic Surfaces:
 - 1. Clear Penetrating Sealer System:
 - a. First Coat: Penetrating Sealer, water based, for concrete floors.
 - b. Topcoat: Penetrating Sealer, water based, for concrete floors.
- D. Steel Substrates:
 - 1. High-Performance Architectural Latex System:
 - a. Prime Coat (Shop Primer): Primer, Alkyd, Anti-Corrosive for Metal (MPI #79).
 - b. Touch-up Primer: Rust Inhibitive Primer, Water Based (MPI #107).
 - c. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - d. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Latex, interior, high performance architectural, Gloss Level 3 (MPI #139).
 - 2) Latex, interior, high performance architectural, semi-gloss, Gloss Level 5 (MPI #141).
- E. Galvanized Steel Substrates:
 - 1. Dry Fall/Fog, Water Based:
 - a. Prime Coat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.
 - b. Topcoat: Dry fall, water based, for galvanized steel, flat (Gloss Level 1), MPI #133.
 - 2. High-Performance Architectural Latex System:
 - a. Prime Coat: Waterborne Galvanized Primer (MPI #134).
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and

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Drawings for Gloss Level. Apply one of the following:

- 1) Latex, interior, high performance architectural, Gloss Level 3 (MPI #139).
- 2) Latex, interior, high performance architectural, semi-gloss, Gloss Level 5 (MPI #141).

F. Wood Substrates:

1. High-Performance Architectural Latex System:

- a. Prime Coat: Primer, latex, for interior wood (MPI #39).
- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
- c. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Latex, interior, high performance architectural, Gloss Level 3 (MPI #139).
 - 2) Latex, interior, high performance architectural, semi-gloss, Gloss Level 5 (MPI #141).

G. Gypsum Board Substrates:

1. High-Performance Architectural Latex System (apply at substrates exposed to high humidity or moisture):

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
- c. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Latex, interior, high performance architectural, (Gloss Level 3) (MPI #139).
 - 2) Latex, interior, high performance architectural, semi-gloss (Gloss Level 5) (MPI #141).

2. Latex System:

- a. Prime Coat: Primer sealer, latex, interior (MPI #50).
- b. Prime Coat: Latex, interior, matching topcoat.
- c. Intermediate Coat: Latex, interior, matching topcoat.
- d. Topcoat: Refer to Section 09 06 00 - SCHEDULE FOR FINISHES and Drawings for Gloss Level. Apply one of the following:
 - 1) Latex, interior, flat, Gloss Level (MPI #53).
 - 2) Topcoat: Latex, interior, Gloss Level 3 (MPI #52).
 - 3) Topcoat: Latex, interior, semi-gloss, Gloss Level 5 (MPI #54).

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.

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- 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. Refinish areas as specified for new work to match adjoining work unless specified or scheduled otherwise.
- G. Coat knots and pitch streaks showing through old finish with MPI 36 (Knot Sealer) before refinishing.
- H. Sand or dull glossy surfaces prior to painting.
- I. 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 prime and body coats to not show through the finish coat and to mask surface imperfections or contrasts.
- D. Painting, Caulking, Closures, and Fillers Adjacent to Casework:
 - 1. Paint to match color of casework where casework has a paint finish.
 - 2. Paint to match color of wall where casework is stainless steel, plastic laminate, or varnished wood.

3.10 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

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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 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 direct to metal (DTM) Light Industrial Coating, Exterior Water-Based, Semi-Gloss (Gloss Level 5) MPI 163 to the following ferrous metal items:
 - 1) Vent and exhaust pipes with temperatures under 94 degrees C
 - 2) (200 degrees F), roof drains, fire hydrants, post indicators, yard hydrants, exposed piping and similar items.

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- b. Apply two coats of direct to metal (DTM) Light Industrial Coating, Exterior Water-Based, Semi-Gloss (Gloss Level 5) MPI 163 to the following metal items:
 - 1) 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 direct to metal (DTM) Light Industrial Coating, Exterior Water-Based, Semi-Gloss (Gloss Level 5) MPI 163 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. 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) Steam line flanges, bare pipe, fittings, valves, hangers and supports over 94 degrees K (200 degrees F).

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.

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- b. Anodized aluminum, stainless steel, chromium plating, copper, and brass, except as otherwise specified.
 - c. Signs, fixtures, and other similar items integrally finished.
- 3. Concealed surfaces:
 - a. Inside dumbwaiter, elevator and duct shafts, interstitial spaces, pipe basements, crawl spaces, pipe tunnels, above ceilings, attics, except as otherwise specified.
 - b. Inside walls or other spaces behind access doors or panels.
 - c. Surfaces concealed behind permanently installed casework and equipment.
- 4. Moving and operating parts:
 - a. Shafts, chains, gears, mechanical and electrical operators, linkages, and sprinkler heads, and sensing devices.
 - b. Tracks for overhead or coiling doors, shutters, and grilles.
- 5. Labels:
 - a. Code required label, such as Underwriters Laboratories Inc., 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. Metal safety treads and nosings.
- 8. Gaskets.
- 9. Concrete curbs, gutters, pavements, retaining walls, exterior exposed foundation walls and interior walls in pipe basements.
- 10. Face brick.
- 11. Structural steel encased in concrete, masonry, or other enclosure.
- 12. Structural steel to receive sprayed-on fire proofing.
- 13. Ceilings, walls, columns in interstitial spaces.
- 14. Ceilings, walls, and columns in pipe basements.
- 15. 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.

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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 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 BACKGROUND	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
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 _____*
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
Vent Line		Yellow	Black	Vent
Cold Water (Domestic)	White	Green	White	C.W. Dom
Hot Water (Domestic)				
Supply	White	Yellow	Black	H.W. Dom

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PIPING	COLOR OF EXPOSED PIPING	COLOR OF BACKGROUND	COLOR OF LETTERS	LEGEND ABBREVIATIONS
Return	White	Yellow	Black	H.W. Dom Ret
Tempered Water	White	Yellow	Black	Temp. Wtr
Sanitary Waste		Green	White	San Waste
Sanitary Vent		Green	White	San Vent
Storm Drainage		Green	White	St Drain
Pump Drainage		Green	White	Pump Disch
Atmospheric Vent		Green	White	ATV
Fire Protection Water				
Sprinkler		Red	White	Auto Spr
Standpipe		Red	White	Stand
Sprinkler		Red	White	Drain

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, 15000.
8. See Sections for methods of identification, legends, and abbreviations of the following:
 - a. 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.
 - b. Conduits containing high voltage feeders over 600 volts: Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS / Section 27 05 33, RACEWAYS AND BOXES FOR COMMUNICATIONS SYSTEMS / Section 28 05 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.

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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 - - -

SECTION 10 14 00**SIGNAGE****PART 1 - GENERAL****1.1 SCOPE OF WORK**

- A. Review of Construction Drawings: Bidders shall, as a part of their bid, call specific attention to any construction details, materials, methods of fabrication or other similar items which they consider to be impractical or not in keeping with good industry practice. Requests for change orders for substitutions to address such items after award of contract shall not be accepted.
- B. Quantities/Unit Process: the bid quantity for each Sign Type shall be based on the Sign Schedule. The Contract shall establish unit costs based on these quantities, and the bid shall consist of extensions of these unit costs. The contract shall be adjusted as necessary, using these unit costs, for additions or deletions within ten percent of the base bid quantity for each Sign Type.
- C. Scope of Work by Sign Type:
 - 1. Interior Sign Types: IN-420, IN-325.1, IN-360.1, IN-14, IN-15, IN-400.1, IN-300, IN-321, IN-322, IN-323, IN-02.07, IN-02.07.1, IN-02.08, IN-200, IN-01.21, IN-01.15, IN-01.22, IN-320.1, IN-320.2, IN-320.3, IN-325, IN-01.01.02, IN-01.34, IN-01.31.2, IN-08.02, IN-01.31.1, IN-01.13.1, OM-01.08, IN-1.09.
 - 2. Exterior Canopy Sign
- D. Allowance for Submittals: Allow for thorough and complete preparation of all submittal items described at Section 1.4, for delivery and/or shipping of same, and for resubmittal(s) as required until approval has been obtained for all items.

1.2 RELATED SECTIONS

- 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.

1.3 STRUCTURAL DESIGN AND ENGINEERING

- A. Details in the Drawings indicate a general design approach for sign structures but do not necessarily include the specific fabrication details required for the complete structural integrity of the signs, nor do they necessarily consider preferred shop practices of individual contractors. Such specific fabrication details shall be provided by the Contractor, who shall ensure that all signs withstand any and all static, dynamic and/or

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erection loads that act upon them, including all such loads associated with handling, erecting, and servicing.

- B. Contractor shall furnish a complete structural design for each and every sign type, incorporating all reasonable safety factors necessary to protect the Owner and Contractor against public liability.
- C. All such structural designs shall meet applicable local, state, and national codes, as well as testing laboratory listings, where required.
- D. Contractor shall be responsible for the engineering and internal construction of all signs, and shall submit shop drawings and details for review by the Architect. Shop drawings for Sign Types (TBD) shall be designed and stamped by a licensed Engineer currently registered in the State of California. Said stamped shop drawings shall specify all structural components and methods required to withstand the design wind load and design seismic load at the location of the sign(s).
 - 1. All structural design shall meet applicable local, state, and national codes, as well as testing laboratory listings, where required.
 - 2. Seismic Forces: Engineered shop drawings shall specify all necessary measures to withstand seismic forces at the project location.
 - 3. Wind Load: Engineered shop drawings shall reflect the soil type and compaction and the design wind load at the project location. Assume maximum wind of 80mph and wind pressure of 12.5 psf unless otherwise indicated. Comply with the requirements of Chapter 16 or 16A, Section 1609, of the CBC as apply.

1.4 SUBMITTALS

- A. Presubmittal Conference: Coordinate with the Architect prior to preparation of submittals to confirm submittal requirements and schedule.
- B. Product Data: If requested by Architect, submit manufacturers' catalog sheets, brochures, diagrams, schedules, charts, illustrations, test results and/or other standard descriptive data.
 - 1. Mark up each copy to identify pertinent materials, products or models.
 - 2. Show dimensions and clearances required, performance characteristics and capacities, and wiring diagrams and/or controls as apply.
- C. Shop Drawings:
 - 1. All shop drawings shall be neat, well organized and clearly legible. Elevations and plan views from the Construction Drawings may be reproduced for the sake of expedience where appropriate.
 - 2. All shop drawings shall be drawn to scale and not subsequently reduced to fit a drawing format.
 - 3. Submit elevations and plan views for all sign types, including graphic layouts, complete dimensions, materials, locations of all exposed fasteners, colors and finishes. Determine the total quantity for each sign type and note it in the shop drawings.

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4. Submit comprehensive section drawings for sign types where applicable, including sections of all typical members. Show fabrication and installation details, including details for securing members to one another, to building structures, and/or to site work. Show interior construction, reinforcements, anchorages, components and finishes. Reproduction of section drawings shown in the Construction Drawings shall not be acceptable.
5. Site Condition Verification: Where required by the Architect for specific items, Contractor shall inspect site to confirm installation conditions, then submit shop drawings and/or written documentation for approval indicating proposed mounting devices.

D. Samples:

1. Color and Finish: Submit 3 each, 6 inch x 6 inch samples of all paint colors, screen colors, vinyl colors and material finishes. All paint and screen colors are to be applied to the appropriate substrate.
 - a. Contractor to submit verification of paint manufacturer used for submittal.
 - b. Prior to submittal, Contractor shall verify that all colors submitted as samples match accurately the samples or specifications provided by Architect.
2. Typeface(s): Submit complete typeface font(s), including upper and lower case letters, numbers and punctuation, for all typeface(s) specified. Also submit samples of letter and word spacing for each cap height specified.

E. Prototypes:

1. Submit one full-size complete prototype each for the following Sign Types:
 - a. Sign Type IN-310
 - b. Sign Type IN-300
 - c. Sign Type IN-351.A
 - d. Sign Type IN-320.3
 - e. Sign Type IN-323
 - f. Sign Type IN-325.1
 - g. Sign Type IN-01.01.02
 - h. Sign Type IN-01.13.1
 - i. Sign Type IN-01.22
 - j. Sign Type IN-01.31.1
 - k. Sign Type IN-01.34.1
 - l. Exterior Canopy Sign: Channel LED "Emergency" (Single letter with raceway configuration)

F. Artwork and Approvals for Emergency Evacuation Plans (EEPs):

1. Architect shall provide digital artwork for one EEP, approved by the Palo Alto Fire Department, to the Contractor as an Adobe Illustrator file. This file will serve as a template for the Contractor's use. Architect shall also provide the plan locations for all EEPs.

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2. Using said template and locations, Contractor shall generate digital artwork for all the other EEPs listed in the Sign Schedule. All artwork shall reflect accurately the graphic layout, graphic conventions and colors of the template. All EEPs shall be "rotated" to the appropriate compass orientation at each location shown on the Sign Location Plans. Each EEP shall show the locations of all fire extinguisher cabinets and fire alarm pull boxes, and the primary and secondary exit paths, as shown on drawings provided or referenced by the Architect.
3. Contractor shall then submit a complete set of half size black and white laser prints of the EEPs to the Palo Alto Fire Department and obtain their written approval of same.
4. Contractor shall submit a complete set of half size black and white laser prints of the EEPs, as approved by the Palo Alto Fire Department, to Architect for final review and written approval of graphic layouts only prior to production of full size color prints or screen negatives; Architect shall not review for nor be responsible for any errors or omissions.
5. Contractor shall submit one full size EEP to Architect for final approval of color. All subsequent color prints or screened images shall match this approved sample, which will be retained by Architect for quality control.

G. Quality Control:

1. Samples, mock-ups and prototypes shall not be permanently installed, but shall be retained by the Architect for record and quality control, unless otherwise noted by the Architect.
2. If requested by Architect, submit manufacturer's installation instructions for each type of specialty sign. Include only pages that are pertinent, or manufacturer's standard drawings modified to delete non-applicable data.

1.5 QUALITY ASSURANCE

- A. Do not scale drawings for dimensions. Use only the written dimensions indicated on the Drawings, unless such be found in error. Contractor shall verify and be responsible for all dimensions and conditions shown by the Drawings, and shall visit the site to inspect and verify field conditions prior to fabrication and installation. The Architect shall be notified, in writing, of all discrepancies on Drawings, in field dimensions or conditions, and of changes required in construction details.
- B. Provide each type of sign as a complete unit produced by a single manufacturer, including all required mounting accessories, fittings and fastenings.
- C. All details shown in the Drawings shall be followed for exterior appearance. Minor changes in interior construction will be accepted in order to conform to Contractor's shop practices or engineering requirements when, in the Architect's sole judgment, such changes do not detract materially from design concept or intent. Contractor shall circle all such changes on the shop drawings.

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- D. Completed work shall be structurally sound, and free from scratches, distortions, chips, breaks, blisters, holes, splits or other disfigurements considered as imperfections for the specific material.

PART 2 - PRODUCTS**2.1 ACCEPTABLE SIGN FABRICATORS**

- A. Weidner Architectural Signage; Sacramento, CA (916) 452-8000. Attn: Rick Weidner
- B. Martinelli Environmental Graphics; San Francisco, CA (415) 621-1559. Attn: Jack Martinelli
- C. Thomas Swan Sign Company; Richmond, CA (510) 232-9610. Attn: Mike Roberts
- D. The proposed substitution of other sign fabricators for those listed above may be considered by the Architect if said sign fabricator(s):
 - 1. Demonstrates that his/her applicable product(s) are equal in salient characteristics such as construction, quality, durability, appearance and warranty to those of the acceptable sign fabricators listed.
 - 2. Demonstrates that the key personnel to be assigned to the project have a consistent history of thorough quality control, adherence to schedule and promptness of communication equal to those of the acceptable sign fabricators listed. Said key personnel shall include the project manager, the shop supervisor, the art department supervisor and the lead installer.
 - 3. Supplies three positive references from reputable environmental graphic design consultants for comparable work.

2.2 MATERIALS

- A. Aluminum:
 - 1. Extruded Shapes: Provide alloy 6063; size as required, or as specified by Engineer.
 - 2. Flat Sheet: Provide alloy 3003; mill finish as specified, for all work that will receive a painted finish.
- B. Stainless Steel:
 - 1. Provide Alloy #304, Number 2B, in gauge(s) called out in the Construction Drawings.
 - 2. Provide mill finish on all surfaces to be painted and brushed finish on all surfaces to remain exposed.
- C. Cast Acrylic Sheet:
 - 1. Provide cast (not extruded or continuous cast) methyl plastic sheet, in sizes, thickness and finishes indicated, with a minimum flexural strength of 16,000 pounds per square inch when tested in accordance

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with ASTM D790, and a maximum allowable continuous service temperature of 176 degrees Fahrenheit.

2. Cast acrylic sheet shall have a flame resistance such that application of a lighted match shall not produce melting, flashing, flaring or distortion. This material shall not ignite at a temperature less than 800 degrees Fahrenheit.
3. Carefully follow manufacturer's recommended fabrication procedures regarding expansion/contraction, fastening and restraining of acrylic plastic.

D. Polycarbonate Sheet:

1. Provide impact-resistant extruded polycarbonate plastic sheet (Lexan or approved equal) in size, thickness and finish indicated, with a minimum tensile yield strength of 8,500 pounds per square inch when tested in accordance with ASTM D882-36T, and a maximum allowable continuous service temperature of 185 degrees Fahrenheit.
2. Extruded polycarbonate sheet shall not ignite at a temperature less than 900 degrees Fahrenheit.

E. Tactile Signs (Interior Grade):

1. Provide light sensitive photopolymer layer/polyester base, manufactured to produce a hardened, etched surface with 1/32" relief copy and/or Braille dots after exposure to ultraviolet light. Wash and post-wash exposed materials in accordance with manufacturer's instructions.
2. Produce tactile signs with etched polymer type WFH 95 as manufactured by BASF, Pittman, or approved equal.
3. Sign Face Finish: Provide acrylic lacquer, high volume spray applied.
4. Text and/or Graphics Finish: Provide multi-plastic or other paint silkscreened for high adhesion. Coating shear lines to precisely reflect letterforms and/or graphic outline contours.
5. Protective Sign Finish: Provide non-glare transparent acrylic lacquer glaze.
6. Laminated Photopolymer:
 - a. Sign Face: Provide photosensitive polyamide resin emulsion.
 - b. Sign Face Carrier: Provide .011 polyester film.
 - c. Laminating Material: Provide high bond, pressure sensitive, high viscosity adhesive.
7. Pre-laminated Photopolymer: Provide .033" acrylic photopolymer bonded to .080 inch phenolic backing (overall thickness 1/8").

F. Tactile Signs (Exterior Grade):

1. Provide exterior grade light-sensitive photopolymer layer of PVA/urethane base composition, manufactured to produce an etched surface with 1/32" relief copy and/or Braille dots after exposure to ultraviolet light, and with a minimum 95 Shore D durometer hardness rating. Photopolymer to be processed and baked to factory

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- specifications only. Wash and post-wash exposed materials in accordance with manufacturer's instructions.
2. Sign Face Primer: Provide Matthews #74-777 Tie Bond.
 3. Sign Face Topcoat: Provide Matthews Acrylic Polyurethane.
 4. Text and/or Graphics Finish: Provide multi-plastic or other paint silkscreened for high adhesion. Coating shear lines to precisely reflect letterforms and/or graphic outline contours.
 5. Protective Sign Finish: Provide Matthews #SOA-4158 ADA clear, applied per manufacturer's instructions
 6. Pre-laminated Photopolymer: Provide photopolymer layer integral with 1/8" phenolic backing.
- G. Braille: Contractor shall be responsible for the accurate translation of all applicable tactile copy to Contracted Grade 2 Braille. All Braille shall be produced in accordance with California Title 24 requirements: Dots shall be 1/10 inch (2.54 mm) on centers in each cell with 2/10 inch (5.08 mm) space between cells. Dots shall be raised a minimum of 1/40 inch (0.635 mm) above the background.
- H. Applied Tactile Copy:
1. Provide 1/32" Rowmark ADA Alternative Applique in colors called out in the construction drawings.
- I. Fasteners, Hardware and Devices: Stock proprietary fastening devices of approved standard manufacture such as cadmium plated screws, bolts and washers, and stainless steel hinges.
1. Conceal all fasteners except where noted or shown otherwise.
 2. Finish on all exposed devices to match overall sign finish, unless otherwise noted.
 3. Provide vandal-resistant fasteners at all exposed locations unless otherwise noted.
 4. Use fasteners fabricated from metals that are noncorrosive to either the sign material(s) or the mounting surface.
- J. Very High Bond Tape: Provide #4905/.020"/clear and/or #4950/.045"/white closed cell acrylic foam carrier with VHB adhesive, very high solvent resistance and very high shear and peel adhesion.
- K. Acrylic Polyurethane Paint:
1. Provide acrylic polyurethane with ultraviolet inhibitors and lightfast, weather, abrasion and graffiti resistant. Prime and finish coats shall be mixed and applied in accordance with manufacturer's specifications. Paint finish shall be smooth, free of scratches, gouges, drops, bubbles, thickness variations, foreign matter or other imperfections.
 - a. Provide a CCR Title 24-compliant non-glare finish for all interior applications.
 - b. Provide a semi-gloss finish for all exterior applications.

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2. Colored Coatings for Cast Acrylic Sheet: Use paints for background color which are recommended by acrylic manufacturer for optimum adherence to acrylic surfaces and are non-fading for application intended.
3. Contractor shall provide verification of paint manufacturer used for all paintwork.

L. Screen Media:

1. Screened graphics shall be produced with screening ink or paint compatible with substrate, using mesh of 390 or finer to produce clean, sharp edges. Media are to be opaque, with full even coverage, and free from hickies, dust, bubbles and/or other blemishes or foreign matter.
2. Provide matte finish clear coat over all screened graphics to protect graphics from scratching or flaking.

M. Paper Emergency Evacuation Plan Inserts:

1. All emergency evacuation maps shall be 11' x 17" IRIS or Fiery RIP color images, matte finish, printed on paper of sufficient weight to prevent drooping or curling when inserted into the protective frame.

N. Vinyl Film: Provide opaque reflective or non-reflective vinyl film as indicated, 0.0355" minimum thickness, with pressure sensitive permanent adhesive backing. All colors shall be integral and not surface applied except where custom color(s) are specified in the Drawings. All custom colors shall be flood coated on white vinyl.

2.3 FABRICATION

A. Intent of Specifications: All finished work shall be of the highest quality in order to pass eye-level examination and scrutiny by Architect.

1. All Work shall be free from burrs, dents, raw edges and sharp corners.
2. Finish all welds on exposed surfaces as required so they are not visible in the finished Work.
3. Finish all surfaces smooth unless otherwise indicated or specified.
4. Surfaces, which are intended to be flat, shall be free from bulges, oil-canning, gaps or other physical deformities. Such surfaces shall be fabricated to remain flat under installed conditions.
5. Surfaces, which are intended to be curved, shall be smoothly free-flowing to the required shape(s).
6. Fabricate all cabinets, panels and components with smooth, mechanically finished edges. All edges shall be true, and all corners shall be square. Where edges are specified to be painted, fill and sand smooth as required prior to painting.
7. Cut routed letterforms and/or graphics clean and true to match adjacent surface-applied letterforms and/or graphics.
8. Fabricate all internally illuminated sign cabinets as required to provide a weathertight housing for all lighting and electrical components.

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9. Exercise care to protect all polished and/or plated surfaces so that they remain unblemished in the finished Work.
 10. Isolate dissimilar materials. Exercise particular care to isolate nonferrous metals from ferrous metals as required to prevent corrosion.
 11. All surfaces shall be flat to a tolerance of plus or minus 1/16" when measured at any point with a ten foot straight edge.
 12. All visible sign surfaces of the same type shall have the same finish. Color and/or finish shall be consistent across the entire surface of a sign.
 13. All reveals shall be of uniform width; all butt joints shall be tight and closed along the entire length; all access panels shall have a nominal, uniform gap all around.
 14. All expansion joints, when required, shall be positioned so as not to interfere with the look or finish of any sign message or the overall appearance of the sign face.
 15. All gaps between milled components, when assembled, shall not exceed a tolerance of .005".
- B. Provide colors and/or finish textures as specified or indicated in the Drawings or, where not specified or indicated, as selected by Architect.
1. Interior Colors/Finishes: Colors of sign graphics (text, arrows and/or symbols) shall have a minimum of 70% contrast with sign background behind graphics. Finish shall be non-glare on all sign backgrounds behind graphics on identifications and directional signs.
- C. Graphics: All text, arrows and symbols shall be provided in the sizes, colors, typefaces and spacing specified in the Drawings. All text shall be a true, clean, digitally or photomechanically accurate reproduction of the typeface(s) specified, with letterspacing and directional arrows as shown in the Drawings.
1. Lettering: Custom Typography: Use Adobe Type Library, Trade Gothic LT Standard.
 2. Arrows and Symbols: Use digital files provided by Architect in Adobe Illustrator for Macintosh.
- D. Sign Schedule: Copy shown in the Drawings is for layout purposes only; all final copy, quantities and references for all signs are shown in the Sign Schedule unless otherwise noted. The Contractor shall clarify any perceived irregularities in the Sign Schedule with the Architect prior to fabrication.
- E. Digital Artwork: All digital artwork files prepared by the Architect for the Contractor's use shall be in a single layer. Any and all manipulations of the files required for subsequent use by the Contractor, such as spreads and traps for silkscreen negatives, or conversion to outline or EPS, shall be the responsibility of same unless explicitly agreed otherwise by the Architect.
- F. Artwork for Emergency Evacuation Plans (EEPs):

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1. Architect shall produce one representative EEP to serve as a model for graphic layout, graphic conventions, colors and color distribution.
2. Architect shall submit same to the Palo Alto Fire Department for review and approval relative to the requirements of California Title 19, and the specific, additional requirements of the Palo Alto Fire Department if applicable.
3. After said approval has been obtained, Architect shall provide digital artwork for the approved EEP only to the Contractor as an Adobe Illustrator file for Macintosh. This file will serve as a template for the Contractor's use.
4. The digital artwork for all other required EEPs as listed in the Sign Schedule, and any and all required approvals of same by the Palo Alto Fire Department shall be the sole responsibility of the Contractor as set forth at Section 1.4 above.

PART 3 - EXECUTION**3.1 INSPECTION**

- A. Architect reserves the right to inspect the Work in the Contractor's shop before it is shipped to the job site for installation.
- B. Contractor shall inspect all installation locations for conditions which will adversely affect the execution, permanence and/or quality of the Work, and notify Architect in writing of any and all unsatisfactory conditions. Contractor shall not proceed with installation until said unsatisfactory conditions have been corrected. Commencement of installation indicates acceptance of site conditions and guarantees delivery of an acceptable product.

3.2 INSTALLATION

- A. Pre-installation Walkthrough / Field-Staking: Attend a pre-installation walkthrough at the job site to confirm all typical installation conditions and determine installation locations for nontypical conditions. The exact locations for all exterior signs will be determined and field-staked at this time. Do not begin excavation for the footing for any exterior sign until the field-staked location has been approved by the Architect and/or Owner's representative.
- B. Provide reinforced concrete footings where required, with plan dimensions as shown and depth as specified by Engineer. Use sonotube type formwork for post and panel signs at all landscape locations; core drill and set post(s) in epoxy grout at all hardscape locations.
- C. Where a concrete footing is level with finished grade to serve as a mow strip, slope the top of the footing away from the sign cabinet or post(s) minimally as required for drainage and to prevent puddling.
- D. Securely attach all signs to footings or site work in accordance with Engineer's specifications.

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3.3 SIGN LOCATIONS

- A. All signs identifying permanent rooms and spaces shall be located in compliance with CBC 1117B.5.9: Center of sign to be 5'-0" above finish floor. Sign to be located at latch side of door, or, if there is insufficient wall space, on the nearest wall, preferably to the right.
- B. Symbol signs on restroom doors shall be located in compliance with CBC 1115B.5: Center of sign to be 5'-0" above finish floor. Sign to be centered left to right on door.
- C. Firefighters' Information signs in enclosed stairwells shall be located in compliance with Title 19: Bottom of sign to be 4'-0" above stair landing floor or as directed by Fire Department. Sign shall be placed beyond door swing for optimal visibility from stair legs above and below landing.
- D. Emergency Evacuation Map: Bottom of sign to be 4'-0" above finish floor or as directed by Fire Department.

3.4 SITE CLEANUP

- A. Final cleanup:
 - 1. Clean and/or repair all evidence of installation work or damage to site work or other adjacent surfaces prior to completion of work.
 - 2. Clean up work area after all installation has been completed. Restore all disturbed ground cover.
 - 3. Remove all protective materials and dispose of properly off site.

3.5 CLEANING AND PROTECTION

- A. At completion of installation, clean all sign surfaces in accordance with manufacturer's instructions.
- B. Protect all signs from damage until acceptance by Architect; repair or replace damaged units as required.
- C. Clean and/or repair all evidence of installation work or damage to adjacent surfaces prior to completion of work.
- D. Remove all protective materials and dispose of properly off site.

3.6 CONTRACT CLOSE-OUT ITEMS

- A. Provide Owner with one quart of paint for each paint color specified.
- B. Provide Owner with written instructions for proper cleaning of the signs. Note any solvents that should not be used.

3.7 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.

- - - END - - -

SECTION 10 21 23**CUBICLE CURTAIN TRACKS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies cubicle curtain track (C.C.T.)

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. Steel shapes for suspending track assembly: Section 05 50 00, METAL FABRICATIONS and Section 09 51 00, ACOUSTICAL CEILINGS.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Samples:
 - 1. One 300 mm (12 inch) long piece of cubicle curtain track with carrier access and end stop.
 - 2. One clip anchor for fastening track to grid system of acoustical ceilings.
 - 3. One curtain carrier.
 - 4. One intravenous support assembly consisting 300 mm (12 inch) long pieces of track, carrier assembly, and bottle pendant.
- C. Shop Drawings: Showing layout of tracks and method of anchorage.
- D. Manufacturer's Literature and Data:
 - 1. Cubicle curtain track.
 - 2. Intravenous support assembly.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver material in original package marked to identify the contents, brand name, and the name of the manufacturer or supplier.
- B. Store in dry and protected location. Store so as to not bend or warp the tracks.

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- C. Do not open packages until contents are needed for installation, unless verification inspection is required.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - 1. B221-06 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.
 - 2. B456-03 Electrodeposited Coatings for Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- C. The National Association of Architectural Metal Manufacturers (NAAMM):
 - 1. AMP 500 Series Metal Finishes Manual

PART 2 - PRODUCTS

2.1 CUBICLE CURTAIN TRACKS

- A. Surface mounted:
 - 1. Channel Tracks (Surface Mounted Type): Extruded aluminum, ASTM B221, alloy 6063, temper T5 or T6, channel shaped, with smooth inside raceway for curtain carriers.
 - 2. Tubular Track (Suspended Type): Seamless drawn aluminum tubing, ASTM B221, alloy 6061 temper T6, 25 mm (one inch) outside diameter, not less than 1.5 mm (0.060 inch) wall thickness, slotted for interior carriers.
- B. Curtain Carriers: Nylon or delrin carriers, with either nylon or delrin wheels on metal, delrin, or nylon axles. Equip each carrier with either stainless steel, chromium plated brass or steel hooks with swivel, or nickel chromium plated brass or stainless steel bead chain and hook assembly, or delrin carriers may have moulded on delrin hooks. Hook for bead chain may be the same material and finish as the bead chain or may be chromium plated steel. Provide 2.2 carriers for every 300 mm (one foot) of each section of each track length, plus one additional carrier.
- C. End Stop Connectors, Ceiling Flanges and Other Accessories: Fabricate from the same material with the same finish as the tracks or from nylon.
- D. Hangers and Fittings: Fabricate from the same material with the same finish as the tracks. Hangers may be round or square for channel tracks and round for tubular tracks. Design fittings to be compatible with design of tracks and to safely transmit the track load to the hangers.
- E. At end of each section of track, make provision for insertion and removal of carriers. Design to prevent accidental removal of carrier. Any operating mechanism shall be removable with common tools.

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2.2 FASTENERS

- A. Exposed Fasteners, Screws and Bolts: Stainless steel or chromium/nickel plated brass.
- B. Concealed Fasteners, Screws and Bolts: Hot-dip galvanized (except in high moisture areas use stainless steel).

2.3 FINISHES

- A. Aluminum: Finish numbers for aluminum specified are in accordance with The Aluminum Association's Designation System. AA-C22A31 finish Chemically etched medium matte, with clear anodic coating, Class II Architectural, 0.4 mils thick.

2.4 FABRICATION

- A. Weld and grind smooth joints of fabricated components.
- B. Form tracks and bends of lengths that will produce the minimum number of joints. Make track sections up to 4800 mm (16 feet) without joints. Form corner bend on a 300 mm (12 inch) radius.
- C. Provide steel anchor plates, supports, and anchors for securing components to building construction.
- D. Form flat surface without distortion.
- E. Shop assemble components and package complete with anchors and fittings.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install tracks after finish painting and ceiling finishing operations are complete.
- B. Install track level and hangers plumb and securely anchor to the ceiling to form a rigid installation.
- C. Anchor surface mounted curtain tracks directly to exposed grid of lay-in acoustical tile ceilings with suitable fasteners, spaced approximately 600 mm (24 inches) on center.
- D. Anchor surface mounted curtain tracks to concrete, plaster and gypsum board ceilings with a minimum of 3 mm (1/8-inch) diameter fastenings or concealed clips spaced not more than 900 mm (three feet) on center.
- E. Install suspended track seven feet, three inches above the finished floor, with hangers spaced no more than four feet on center. At ceiling line, provide flange fittings secured to hangers with set screws. Secure track to walls with flanged fittings and to hangers with special fittings.

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- F. Securely fasten end stop caps to prevent their being forced out by the striking weight of carriers.
- G. Anchor surface mounted intravenous track directly to support system above ceiling as shown.
- H. Remove damaged or defective components and replace with new components or repair to the original condition.

3.2 ACCEPTANCE

- A. Track shall be installed neat, rigid, plumb, level and true, and securely anchored to the overhead construction.
- B. Carrier units shall operate smoothly and easily over the full range of travel.

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 10 25 13**PATIENT BED SERVICE WALLS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies the furnishing, installation and connection of the patient wall systems both horizontal and vertical. Patient wall systems are also referred to as prefabricated bedside patient units or PBPUs.

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. Section 09 06 00, SCHEDULE FOR FINISHES: Color and finishes of the patient wall units.
- D. Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES AND Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES: Requirements for air, oxygen and vacuum outlets in the patient wall units.
- E. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General electrical requirements that are common to more than one section of Division 26.
- F. Section 26 05 33, RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS: Raceways and outlet boxes for wiring.
- G. Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW): Cables and wiring.
- H. Section 26 27 26, WIRING DEVICES: Wiring devices to be installed in the patient wall units.
- I. Section 26 24 16, PANELBOARDS: Panelboard requirements for patient wall units with a panelboard.
- J. Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS: Requirements for personnel safety and to provide a low impedance path to ground for possible ground currents.
- K. Section 26 51 00, INTERIOR LIGHTING: Lighting fixture requirements when installed in or connected to the patient wall units.
- L. Section 27 52 23, NURSE CALL/CODE BLUE SYSTEMS: Nurse Call and Code One requirements for installation in the patient wall units.

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1.3 SUBMITTALS

- A. In accordance with Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS, submit the following:
- B. Shop Drawings:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - 2. Include electrical ratings, dimensions, mounting details, front view, side view, equipment and device arrangement, wiring diagrams, material, and connection diagrams.
 - 3. Determine final layout of each style of patient wall system at this stage. Provide configuration drawings showing all possible device (nurse call, medical gases, electrical receptacles and switches, etc.) locations to the Contracting Officer's Representative. The Contracting Officer's Representative will provide by return of submittal the desired configuration of each style of patient wall system. Limit the number and type of devices allowed for each style of unit to the number and type of devices specified for that style below.
- C. Manuals: Two weeks prior to the final inspection, deliver four copies of the following to the Contracting Officer's Representative.
 - 1. Complete maintenance and operating manuals including wiring diagrams, technical data sheets, and information for ordering replacement parts:
 - a. Include complete "As installed" diagrams which indicate all items of equipment, their interconnecting wiring and interconnecting piping.
 - b. Include complete diagrams of the internal wiring for each of the items of equipment, including "As installed" revisions of the diagrams.
 - c. Identify terminals on the wiring diagrams to facilitate installation, maintenance and operation.
- D. Certifications: Two weeks prior to the final inspection, deliver four copies of the following certifications to the Contracting Officer's Representative:
 - 1. Certification by the manufacturer that the equipment conforms to the requirements of the drawings and specifications.
 - 2. Certification by the Contractor that the equipment has been properly installed, adjusted, and tested in accordance with the manufacturer's recommendations.

1.4 APPLICABLE PUBLICATIONS:

- A. Publications listed below (including amendments, addenda, revisions, supplements and errata) form a part of this specification to the extent referenced. Publications are referenced in text by the basic designation only.

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- B. National Fire Protection Association (NFPA):
 - 1. 70-07 National Electrical Code (NEC)
 - 2. 99-05 Health Care Facilities
- C. Underwriters Laboratories, Inc. (UL):
 - 1. UL listed in product category SECTIONS AND UNITS (QQXX). This standard used to investigate listed products in this category is NFPA 70 (NEC).

PART 2 - PRODUCTS**2.1 PATIENT WALL SYSTEMS**

- A. Shall be UL listed.
- B. Shall consist of a structural framework, removable panels and removable equipment console units, factory assembled to house all permanent bedside services including but not necessarily limited to fixtures, grounding jacks, power outlets, telephone outlet, nurses call patient station, medical gas outlet(s) and other fittings or devices.
- C. Shall conform to the following:
 - 1. Applicable requirements in NFPA 70 (NEC) and NFPA 99.
 - 2. Assembly and all components shall be UL listed or labeled.
- D. Coordinate the mounting space provisions for the nurse call equipment with Section 27 52 23, NURSE CALL/CODE BLUE SYSTEMS.
- E. Compressed Air, Oxygen and Vacuum System Equipment: Furnish, install and test the equipment in accordance with the drawings and Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
 - 1. Fixed medical gas outlets are permanently installed in one location and may not be moved without special tools and shutting off the gas involved.
 - 2. Movable medical gas outlets:
 - a. Hose connected to gas manifold type:
 - 1) The hoses connected to gas manifold shall be UL listed and labeled for the purpose.
 - 2) All hoses shall be accessible at all times. Use bars or other restraining devices to control exposed hoses. A panel may cover the hoses provided it can be easily removed without the use of special tools for hose inspection.
 - b. Relocatable type:
 - 1) Relocatable (snap-in) without the use of tools to any one of several different fixed locations.
 - 2) Appropriate relocatable adapter can be used to access available gases from each fixed location.
 - 3) Cover all unused locations with a blank (no gas) adapter

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plate.

F. Electrical receptacles and switches shall comply with the requirements in Section 26 27 26, WIRING DEVICES; grounding in Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS; and internal wiring in Section 26 05 21, LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 VOLTS AND BELOW).

G. Styles:

1. Style A1: A single bed patient wall unit consisting of a horizontal unit. Horizontal units shall consist of a minimum of three rails (two rails can be used if the bed light is independently mounted). Patient bed light power must be wired through the patient wall unit. Provide a middle rail for power, nurse call and medical gases as well as a bottom rail with bed bumper and for bed motor power. The horizontal unit shall have a vertical chase connecting the rails to the above ceiling junction boxes and gas connection points. All electrical devices shall be wired in accordance with the schematic diagram shown on the drawings.
 - a. Provide oxygen gas outlet(s): 1-each fixed or 1-each movable.
 - b. Provide air outlet (s): 1-each fixed or 1-each moveable.
 - c. Provide vacuum outlet(s): 1-each fixed or 1-each movable.
 - d. Provide emergency power outlets: 2-each NEMA 20R single receptacles, self illuminated red with stainless steel or anodized aluminum cover plate, engraved "EMERGENCY POWER" with minimum 6 mm (1/4 inch) red filled letters.
 - e. Provide normal power outlets: 2-each NEMA 20R single white receptacles. One of which is for the bed motor. Provide stainless steel or anodized aluminum cover plates.
 - f. Provide Nurses Call audio-visual single bed station.
 - g. Provide Tele-cart jack.
 - h. Provide an auxiliary light (6 to 7 watts) with hood and switch. Both shall be mounted on a stainless steel or an anodized aluminum face plate installed in a single gang box.
 - i. Provide a switch for the overhead/exam light.
 - j. Provide a patient wall mounted bed light fixture. Refer to Section 26 51 00, INTERIOR LIGHTING. The bed light shall be powered through the patient wall unit.
 - k. Location: Provide at all exam rooms unless otherwise noted.
2. Style B1: Single bed patient wall system consisting of a vertical unit. All electrical devices shall be wired in accordance with the schematic diagram shown on the drawings.
 - a. Provide oxygen gas outlets: 1-each fixed or 1-each movable.
 - b. Provide air outlets: 1-each fixed or 2-each movable.
 - c. Provide vacuum outlets: 1-each fixed or 1-each movable.
 - d. Provide emergency power outlets: 2-each NEMA 20R single receptacles, self illuminated red with stainless steel or anodized aluminum cover plates, engraved "EMERGENCY POWER" with minimum 6 mm (1/4 inch) red filled letters.
 - e. Provide normal power outlets: 2-each NEMA 20R single white

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receptacles. One of which is for the bed motor. Provide stainless steel or anodized aluminum cover plates.

- f. Provide a Nurses Call audio-visual single bed station.
- g. Provide Tele-cart jack.
- h. Provide a switch for the overhead/exam light.
- i. Location: Provide at all diagnostic chair locations, and Triage Room A1-203.

H. All styles of the units shall have the following features:

- 1. Basic structural framework shall be constructed of heavy gage extruded aluminum or minimum 1.9 mm (14 gage) cold-rolled steel, designed to be a self-supporting unit for above-the-floor, for close wall mounting or a freestanding installation. For freestanding units, provide the framework with a base plate and overhead structural supports.
- 2. Drill and tap the side frame members to permit the installation of front panel devices at modular intervals at any elevation between the top and bottom.
- 3. Provide removable front panels:
 - a. Construct panel of the following materials:
 - 1) Fire retarding core material surfaced with a high pressure plastic laminated facing sheet.
 - 2) Vinyl material heat and pressure applied over a minimum of 1.6 mm (0.060 sheet aluminum back braced for rigidity and sound control.
 - 3) Vinyl material heat and pressure applied over sheet steel minimum 1.6 mm (1/16 inch).
 - 4) Vinyl material heat and pressure applied over sheet aluminum minimum 2.0 mm (0.080 inch).
 - b. Color and texture shall be as specified in the Section 09 06 00, SCHEDULE FOR FINISHES.
 - c. Bond the panel edges with an aluminum extrusion or cold-rolled steel trim designed for mounting directly to the structural framework, thus allowing the panels to be easily removed for access to internal components and for servicing of utility connections or future modifications. Secure panels with hidden screws or other means to offer an overall finished appearance. All exposed metal surfaces or trims greater than 4 mm (1/8 inch) wide shall be of anodized aluminum or stainless steel finished to resist abrasion and affects from hospital cleaning compounds.
- 4. Mount patient service components in an equipment console made up of a backbox and finish fascia.
 - a. Use galvanized steel backbox with outlet gang openings on minimum 60 mm (2.4 inches) uniform centers to provide mounting supports of front panel devices. Provide removable metal barriers to separate voltage sources and to facilitate wiring between segregated devices within the same horizontal module.
 - b. Match finish, either anodized aluminum or stainless steel of all fascia and device face plates.
 - c. Fascia and/or face plates may be omitted for power and grounding

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- receptacles in the consoles if the receptacles are mounted flush in the PBPU cover panel and facilities (support members, tapped holes, spacing, etc.) are provided behind the panel for future addition or relocation of receptacles.
- d. Provide smooth external surfaces having a finished appearance. Maintain adequate spacing of device plates and similar items to eliminate crevices and facilitate cleaning.
5. Provide patient services as indicated in paragraphs Styles above, the schematic wiring diagram shown on drawings, and as follows:
- a. Electrical components: Factory assembled and prewired to a sectionalized junction box at the top of the unit in accordance with circuiting and switching arrangements shown on the drawings. Factory assembled prewiring may be stranded in sizes AWG #10 and #12. Provide an equipotential ground bus with lugs suitable for connecting AWG #14 to AWG #6 conductors with a minimum of 48 screw-type terminals, unless otherwise shown.
 - b. Receptacles: Single Hospital Grade NEMA 5-20R, unless otherwise specified.
 - c. Provide medical gas components compatible with those installed elsewhere in the project that are factory assembled, manifolded and pre-piped, using medical grade copper pipe, to single point connections of each service at the top of the units.
 - d. Provide nurse call services consisting of provisions for adequate space and matching face plates for the equipment and empty conduit to the sectionalized junction box at the top of the unit.
 - e. Provide internal power and signal wiring in separate EMT, flexible metal conduits or approved raceway. Separate normal power circuits from emergency power circuits. Also, provide adequate supports for conduits and piping within the structural frame.
 - f. Telephone outlets/jacks: Plug-in type as approved by the VAMC.
 - g. Except for anodized aluminum and galvanized or stainless steel surfaces, clean and paint all other metal surfaces at the factory with primer and not less than two coats of baked enamel.

PART 3 - EXECUTION**3.1 INSTALLATION:**

- A. Installation shall be in accordance with NFPA 70 (NEC), NFPA 99, and as shown on the drawings.
- B. Compressed Air, Oxygen and Vacuum System Equipment:
 - 1. Install and test the equipment and piping system in accordance with the drawings and Section 22 62 00, VACUUM SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES and Section 22 63 00, GAS SYSTEMS FOR LABORATORY AND HEALTHCARE FACILITIES.
 - 2. Install and make connections as required for a complete and operational patient wall system for each unit.

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3.2 CONSTRUCTION WASTE MANAGEMENT

- A. General: Comply with Contractor's Waste Management Plan and Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT.
 - 1. 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 26 00**WALL AND DOOR PROTECTION****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies handrails / crash rail combinations, and door/door frame protectors.

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. Structural steel corner guards: Section 05 50 00, METAL FABRICATIONS.
- D. Armor plates and kick plates not specified in this section: Section 08 71 00, DOOR HARDWARE.
- E. 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. Handrails / Crash Rail.
 - 2. Wall Guards.
 - 3. 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.

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- C. Store in a dry environment of approximately 21° C (70 degrees F) for at least 48 hours prior to installation.

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.

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- 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.
- 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 WALL GUARDS AND HANDRAILS

- A. Surface mounted handrail/crash rail configuration with end caps returning to the wall. Attachment hardware shall be appropriate for wall construction.
 - 1. Handrail: Stainless Steel handrail to be type 304 allow with #4 satin finish, nominal 1/4" (6.35mm) thickness. Cast brackets to be type 304 allow with #4 satin finish.
 - 2. Crash Rail: Vinyl acrylic or polyvinyl chloride resistant material crash rail with matching end caps returning to the wall. Crash rail finish per section 09 06 00 Schedule for Finishes.
- B. Resilient Wall Guards:
 - 1. Fabricate from vinyl acrylic or polyvinyl chloride resilient material minimum 6mm (0.06 inch) thick designed especially for interior use.
 - 2. Coordinate with door and guard rail protection material and supplier for proper fit, installation and color.
 - 3. Provide adhesive as recommended by the wall covering manufacturer.
 - 4. Provide handrails and wall guards 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.

2.3 DOOR AND DOOR FRAME PROTECTION

- A. Fabricate door and door frame protection items from vinyl acrylic or 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.

2.4 FASTENERS AND ANCHORS

- A. Provide fasteners and anchors as required for each specific type of installation.

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- B. Where type, size, spacing or method of fastening is not shown or specified, submit shop drawings showing proposed installation details.

2.5 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.

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.

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3.6 DOOR, DOOR FRAME PROTECTION AND HIGH IMPACT WALL COVERING

- 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 manufacturer'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, BATH, AND LAUNDRY 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. Contractor furnished, Contractor installed (CC) toilet and bath accessories:
 - 1. Grab bars.
 - 2. Clothes hooks, robe or coat.
 - 3. Metal framed mirror.
 - 4. Underlavatory guard.
- C. Government furnished, Government installed (VV) toilet and bath accessories: not applicable
- D. Government furnished, Contractor installed (VC) toilet and bath accessories:
 - 1. Dispenser, Soap.
 - 2. Dispenser, paper towel.
 - 3. Dispenser, toilet tissue.
 - 4. Seat cover dispenser.
- E. 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
- D. Ceramic toilet and bath accessories: Section 09 30 13, CERAMIC TILING
- E. Shower curtain break away pendant chain hooks: Section 10 21 23, CUBICLES.
- F. Color of vinyl fabric: Section 09 06 00, SCHEDULE FOR FINISHES.

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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.

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.

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- 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 or 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
 - 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

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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 specified.
 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.

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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.
- 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,

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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.
- 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.

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- 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.
- 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 COAT HOOK WITH BUMPER

- A. Flange with support arm welded to base plate: fabricated of type 304 stainless steel, 22 gage (0.8 mm).

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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.
- 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 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.

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- B. Weld or Screw brackets to shelves.

2.13 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.

2.14 UNDERLAVATORY GUARDS

- A. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
- B. Material and Finish: Antimicrobial, molded plastic, white.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. Before starting work notify Contracting Officer's Representative in writing of any conflicts detrimental to installation or operation of units.
- B. Verify with the Contracting Officer's Representative the exact location of accessories.

3.2 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.

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- 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.
- J. See drawings for VA provided-VA installed (VV), VA provided-Contractor Installed (VC), and Contractor provided and installed (CC) designations.

3.3 CLEANING

- A. After installation, clean as recommended by the manufacturer and protect from damage until completion of the project.

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 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 10 82 00**GREEN SCREEN TREILLAGE****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section includes: Trellis panels, panel posts, and accessories.
- B. Related Sections: 32 90 00 PLANTING

1.2 REFERENCES:

- A. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- B. ASTM A82 - Mechanical, Physical and Performance Properties of Carbon Steel Wire
- C. ASTM A641 - Zinc-Coated (Galvanized) Carbon Steel Wire
- D. ASTM A879 - Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
- E. ASTM B117 - Operating Salt Spray (Fog) Apparatus.
- F. RAL - German Institute for Quality Assurance and Indication.

1.3 SUBMITTALS

- A. Product Data: Submit manufacturer's product data, standard details, and installation instructions.
- B. Shop Drawings: Submit showing sizes critical dimensions, panel layout constraints using a 2 x 2 inch modular grid, and details and locations of accessories.
- C. Color Submittals: Submit coupons 2 x 3/12 inches minimum showing color and texture to be provided.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Minimum 5 years experience manufacturing and supplying trellis structures of the type required for this project.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect materials from damage. Store panels flat. Provide edge protection when strapping is used. Do not apply loads to panel edges.

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- B. Inspect products upon delivery in order to submit timely freight claim for any damaged materials.
- C. Store products in manufacturer's packaging until ready for installation.
- D. Handle and store products according to manufacturer's recommendations. Leave products wrapped or otherwise protected and under clean and dry storage conditions until required for installation.
- E. Exercise care not to scratch, mark, dent, or bend metal components during delivery, storage, and installation.

PART 2 - PRODUCTS**2.1 ACCEPTABLE MANUFACTURER**

- A. GREENscreen®, Los Angeles, CA; phone 800-450-3494, fax 310-837-0523, www.greenscreen.com, or approved equal.

2.2 PANELS

- A. Panels shall be rigid, three-dimensional welded wire grid fabricated of 14-gage ASTM A641 galvanized steel wire.
- B. Face Grid: Wires shall be welded at each intersection to form a 2 x 2 inch face grid on the front and back of panels,
- C. Trusses: Face grids shall be separated by bent wire trusses spaced at 2-inch centers and welded to front and back face grids at each truss apex.
- D. Thickness: 3 inches
- E. Length and Width: Provide in 2-inch nominal increments.
- F. Tolerance: 1/8 inch in width and ¼ inch in length.

2.3 ACCESSORIES

- A. Trim:
 - 1. Fabricate from 20-gage ASTM A879 galvanized steel.
- B. Types:
 - 1. Channel Trim: Thickness of panel x ½ inch legs.
 - 2. Angle Trim: ½ inch x ½ inch legs.
- C. Locations:
 - 1. Corners formed by intersections of panels: Angle type.
 - 2. Top of Treillage Angle type.

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- 3. Side of Treillage Angle type.
- 4. Bottom of Treillage Angle type.
- D. Clips and Straps: Provide manufacturer's standard types of clips and straps suitable for mounting conditions. Fabricate from ASTM A879 galvanized steel. Adjustable clips shall have ¼ inch diameter 18-8 stainless steel bolt, washer, and nut.
- E. Plastic Spacers: Provide ½ inch thick black Ultra High Molecular Weight polyethylene (UHMW) washers [to hold clips away from mounting surface].
- F. Fence Posts: 3-inch 2-7/8" OD ASTM A500 steel tube. The steel strip used in the manufacture of the post shall conform to ASTM A1011. Minimum yield strength shall be 45,000 psi. Provide steel post caps. Overall post length shall be as indicated on the Drawings.
- G. Fasteners for Mounting Clips to Fence Posts: Self drilling, self tapping hex washer head screws, with strength of Type 410 stainless steel, and corrosion resistance of Type 304 stainless steel.

2.4 FABRICATION

- A. Cut to size.
- B. Weld trim to panels and grind smooth exterior surfaces of welds.

2.5 FINISHES

- A. Metal components (except fasteners) shall be factory finished after fabrication.
- B. Finish System: pretreat with general purpose, alkaline, water based cleaner / degreaser applied at 240 degrees F. prime with zinc-rich epoxy powder coat. Topcoat with polyester or polyester-urethane powder coat.
- C. Salt Spray Resistance: Finish shall remain rust free when tested 1680 hours in accordance with ASTM B117.
- D. Color: Wrinkle-Textured Black
- E. Touch-Up Paint: Provide high quality, exterior-grade spray paint suitable for conditions of use.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Inspect substrates and conditions affecting work of Section. Do not proceed until unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. Spans: For freestanding fences and screens, span between structural supports should not exceed 8' for 3" thick panels without thorough review of specific site conditions and mounting details. For overhead horizontal or inclined panels span between structural supports should not exceed 4'.
- B. Install panels plumb and square, centered within area designated for panels, and aligned to maintain modular grid.
- C. Avoid cutting panels in field. Where field cutting is essential, clean and dry area and apply touch-up paint to cut edges.
- D. Install securely with fasteners located as shown on drawings. To meet manufacturer's requirements.
- E. Repair bent or damaged panels. If panels cannot be repaired to satisfaction of Contracting Officer's Representative. Remove from jobsite and replace with new panels.

3.3 INSTALLATION

- A. Install welded wire panel plant support system by setting posts as indicated on the Drawings and fastening panels to posts according to manufacturer's written instructions.
- B. Repair bent or damaged panels. If panels cannot be repaired to satisfaction of Resident Engineer, remove from jobsite and replace with new panels.

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SECTION 11 24 43.13**WINDOW WASHING SYSTEMS - SAFETY TIE-BACK ANCHOR****PART 1 - GENERAL:****1.1 DESCRIPTION:**

- A. Section includes design and installation of safety tie-back anchors for window washing system.

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.

1.3 SUBMITTALS:

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES, submit following:
 - 1. Manufacturer's Literature and Data:
 - a. Provide data on safety tie-back anchors characteristics and limitations.
 - 2. Shop Drawings:
 - a. Indicate plan layout of system components showing dimensions.
 - b. Indicate details of anchorage devices to be embedded in or fastened to other building elements.
 - c. Indicate jointing and connections. Indicate welded connections using standard AWS symbols, indicate net weld length.
 - d. Indicate schedule and erection procedure for proper installation.
 - 3. Operation Data: Provide operating data to instruct employees in the safe use of the safety tie-back anchors, and any other pertinent information required for Government operation. As a minimum, provide the following:
 - a. Isometric or plan view of the building's roof.
 - b. Identification of drop zones, recommended drop sequences, and specific building maintenance procedures including equipment to be used.
 - c. Identification of anchorage points for personal fall arrest system and building maintenance equipment.
 - d. Identification of all dangerous areas on the roof by highlighting Danger Zones on the drawings.
 - e. Description of the means and methods to be used to transfer equipment from drop location or between building levels.

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- f. Identification of equipment limitations, load ratings, and special use conditions.
 - g. Provisions for pre-operational, operation and maintenance inspections.
 - h. Identification of the access and egress to the work locations and the storage areas for the permanent or transportable building maintenance equipment.
 - i. Indication of the location and the method of stabilization provided for the suspended equipment.
 - j. Emergency and rescue procedures, and means of communications to be used during such procedures.
 - k. Methods to be used to control employee exposure to falls while they are in the Danger Zone.
- 4. Equipment Manual and Inspection Log Book: Submit at closeout, with Initial Inspection - Certification for Use and Inspection Sign-Off forms completed.
- 5. Certificates: Quality Control Certificate Submittals and lists specified in paragraph, QUALIFICATIONS.

1.4 REGULATORY REQUIREMENTS:

- A. Provide window washing system to comply with the following:
 - 1. Cal/OSHA, Title 8, California Code of Regulations (CCR)
 - a. Chapter 4, Article 5, Window Cleaning.
 - b. Chapter 4, Article 6, Powered Platforms and Equipment for Building Maintenance.
 - 2. ANSI/IWCA I-14.1, Window Cleaning Safety.
 - 3. Safety Factor: Design primary equipment to sustain without failure at least four times the maximum static working load applied or transmitted to the components.
 - 4. Design all anchor components to provide adequate attachment to building and to suit current window cleaning and suspended maintenance practices; ensure compatibility with industry standard equipment.
 - 5. Design anchor components using proper engineering principles by a Professional Engineer qualified in the design of window cleaning and suspended maintenance equipment, its application and safety requirements.
 - 6. Structural Steel: Design in accordance with AISC Load and Resistance Factor Design Specification for Structural Steel Buildings.
 - 7. Light Gage Steel: Design in accordance with AISI Specification for Design of Cold Formed Steel Structural Members.

1.5 PROJECT CONDITIONS:

- A. Coordinate placement of anchorage devices to be embedded in or fastened to other building elements.

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- B. Sequence installation to ensure connections are achieved in an orderly and expeditious manner.

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 materials in weathertight and dry storage facility. Protect from damage due to handling, weather, and construction operations before, during and after 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. AISC Load and Resistance Factor Design Specification for Structural Steel Buildings.
- C. AISI Specification for Design of Cold Formed Steel Structural Members.
- D. Aluminum Association Aluminum Design Manual.
- E. American National Standards Institute (ANSI):
 - 1. ANSI/IWCA I-14.1 Window Cleaning Safety.
- F. American Society for Testing Materials (ASTM):
 - 1. A 123/A 123M Zinc (Hot-Dip Galvanized)
- G. Cal/OSHA, Title 8, California Code of Regulations (CCR)
 - 1. Chapter 4, Article 5 Window Cleaning.
 - 2. Chapter 4, Article 6 Powered Platforms and Equipment for Building Maintenance.

1.8 WARRANTY

- A. Submit manufacturer's written warranty for materials and installation in accordance with FAR clause 52.246-21.
 - 1. Warranty: Cover keeping equipment operational.

PART 2 - PRODUCTS**2.1 WINDOW WASHING SYSTEM COMPONENTS:**

- A. Safety and Tie-Back Anchors: U-bar type; Type 304 stainless steel with yield strength of 240 MPa (35 ksi), of not less than 19 mm (3/4 inch) diameter material with 38 mm (1-1/2 inch) eye opening.

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- B. Securement Bolts: Type 304 stainless steel with yield strength of 240 MPa (35 ksi).
- C. Base Plates and Other Sections: Galvanized mild steel as above with yield strength of 300 MPa (44 ksi). Thickness and securement to suit application.
- D. Miscellaneous Bolts, Nuts and Washers: Mild steel, Type 300W with yield strength of 300 MPa (44 ksi), hot dipped galvanized to ASTM A 123/A 123M or Type 304 stainless steel with yield strength of 240 MPa (35 ksi).
- E. Flashing for Roof Mounted Supports and Anchors: In accordance with roofing manufacturer's details and instructions.

2.2 PERFORMANCE REQUIREMENTS:

- A. Fall Arrest Anchors/Fall Arrest Safety Anchor: Design to resist a 24 kN (5,400 pound) force applied in any direction.
- B. Locate anchorages to suit suspension equipment that will be used on the building with respect to items such as reach, rigging, spacing, roof edge construction, and similar items.
- C. Safety Signage: Reduced-size as-built shop drawing or project record drawing showing anchor locations and details.
 - 1. Provide permanently mounted frame and plastic glazing cover.
 - 2. Provide one for each exit onto roof; post near exit.

PART 3 - EXECUTION**3.1 EXAMINATION:**

- A. Verify that structural substrate to which safety anchors are to be attached have adequate bearing surface, either as indicated on shop drawings or as necessary to ensure 100 percent weld area.

3.2 INSTALLATION

- A. Install safety and tie-back anchors in accordance with manufacturer's instructions and approved shop drawings.
- B. Coordinate installation with work of other trades.
- C. Install all work true, level, and tightly fitted and flush with adjacent surfaces as required.
- D. Deform threads of tail end anchor studs after nuts have tightened to prevent accidental removal or vandalism.

3.3 FIELD QUALITY CONTROL

- A. Field test all anchors.

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- B. Test using load cell test apparatus in accordance with manufacturer's recommendations.
- C. Complete initial inspection and issue certification for use to be included in the Equipment Manual and Inspection Log Book.

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 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).
 - b. Government furnished, Contractor installed (VC).
 - c. Government furnished, Government installed (VV)
2. Equipment supports, anchorage.
3. Water, medical gas, electrical service, and other utility service requirements.

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.

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

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immediately furnish the Government representative with a written statement as to its condition or shortages.

- 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.
 4. 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.
 5. Completely assemble and install the Government furnished equipment in place ready for proper operation in accordance with specifications and drawings.
 6. 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

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designated containers and protect from moisture and contamination.

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**SECTION 11 73 00
CEILING MOUNTED PATIENT LIFT SYSTEM**

PART 1 - GENERAL**1.1 DESCRIPTION**

Ceiling Mounted Patient Lift Systems for the transfer of physically challenged patients are specified in this section.

1.2 RELATED WORK

- A. Section 01 00 00, GENERAL REQUIREMENTS: Requirements for pre-test of equipment.
- B. Section 13 05 41, SEISMIC RESTRAINT REQUIREMENTS FOR NON-STRUCTURAL COMPONENTS: Seismic requirements for non-structural equipment.
- C. Section 26 05 11, REQUIREMENTS FOR ELECTRICAL INSTALLATIONS: General Electrical Requirements and items, which are common to sections of Division 26.

1.3 QUALITY ASSURANCE

- A. Certification for compliance is required for Ceiling Mounted Patient Lift Systems. Certifications shall be provided by an independent third party who will conduct testing to ensure that the ceiling lift and charging system are safe and in compliance with ISO 10535 & UL 60601-1
- B. Inspection of equipment after installation is required prior to use for patient movement. Inspection shall be in accordance with manufacturer's installation checklist and the facilities installation checklist (Patient Safety Alert AL14-07).

1.4 SUBMITTALS

- A. Submit in accordance with specification Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.
- B. Certificates of Compliance
- C. Manufacturer's Literature and Data:
 - 1. Lifting Capacity
 - 2. Lifting Speed
 - 3. Horizontal Displacement Speeds
 - 4. Horizontal Axis Motor
 - 5. Vertical Axis Motor
 - 6. Emergency Brake
 - 7. Emergency Lowering Device
 - 8. Emergency Stopping Device
 - 9. Electronic Soft-Start and Soft-Stop Motor Control

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10. Current Limiter for Circuit Protection
 11. Low Battery Disconnect System
 12. Strap Length
 13. All equipment anchors and supports. Submittals shall include weights, dimensions, center of gravity, standard connections, manufacturer's recommendations and behavior problems (e.g., vibration, thermal expansion,) associated with equipment or piping so that the proposed installation can be properly reviewed.
- D. Individual Room layouts showing location of lift system installation shall be approved before proceeding with installation of lifts.
- E. Manufacturer's Checklist for after installation inspection.

1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are listed in the text by the basic designation only.
- B. International Organization for Standardization (IOS):
10535-06.....Hoist for the Transfer of Disabled Persons-
Requirements and Test Methods
- C. Underwriters Laboratories (UL):
60601-1(2003).....Medical Electrical Equipment: General
Requirements for Safety
94-2013.....UL Standards for Safety Test for Flammability
of Plastic Materials for Parts in Devices and
Appliances-Fifth Edition
- D. International Electromagnetic Commission (IEC):
801-2(1991).....Electromagnetic Compatibility for Industrial-
Process Measurement and Control Equipment-Part
2: Electromagnetic Discharge Requirements
- E. Patient Safety Alert AL14-07

PART 2 - PRODUCTS**2.1 CEILING TRACK SYSTEM**

The Ceiling Track shall be made from high strength extruded aluminum T66081-T5 at a thickness of 3/16" (4.8mm). Provide anchor supports at a minimum 3 per linear foot at ceiling substrate. The ceiling track shall be finished with baked enamel paint.

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2.2 LIFT UNIT

- A. The Lift Unit shall be constructed of a steel frame system (2205lbs / 1000kg tested) driven by a gear reduced high torque motor
- B. The Lift system shall have the following features.
 - 1. Lifting capacity: 600 lbs (200 kg)
 - 2. Electronic soft-start and soft-stop motor control
 - 3. Emergency lowering device
 - 4. Emergency stopping device
 - 5. Current limiter for circuit protection in case of overload.
 - 6. Safety device that stops the motor to lift when batteries are low.
 - 7. Lifting speed: 2.3in/s (6 cm/s), 1.6in/s (3.5cm) in full capacity
 - 8. Horizontal displacement speed: 5.9in/s (150mm/s)
 - 9. Horizontal axis motor: 24VDC at 62 watts and vertical axis motor at 110 watts
 - 10. Emergency brake (in case of mechanical failure)
 - 11. Strap length up to 90in (2.3m) tested for 2998lbs (1360kg)
 - 12. Cab: VO plastic-fire retardant, UL 94
 - 13. Wireless remote control (optional)

2.3 MOTORS

- A. Vertical Movement-DC Motor
 - 1. Type: Class A, fully enclosed, permanent magnet.
 - 2. Rating: 24Vdc, 1.1A, 110W, 4000RPM, 0.3N-m.
 - 3. Mounting: Secured to chassis.
- B. Horizontal Movement-DC Motor
 - 1. Type: Fully enclosed, permanent magnet, integral reducer.
 - 2. Rating: 24Vdc, 1.8A, 62W, 260RPM, 1.0N-m.
 - 3. Mounting: Secured to chassis.

2.4 BATTERIES

- A. The life cycle (number of charging cycles) for batteries shall be in compliance with IEC 801-2.
- B. Provide rechargeable batteries with up to 120 transfers with a load of 200lbs (74kg) and up to 70 transfers with its maximum load of 440lbs (200kg).

2.5 CHARGER

- A. Charger Input: 100-240 Vac, 50/60 Hz.
- B. Charger Output: 27 Vdc, 1 A max.

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- C. Supplemental to the charger provide a clip on charging station with indicator lights.

2.6 STRAPS AND SLING

- A. The straps shall be made of threaded nylon. The straps shall ensure the patient's safety by preventing the patient from falling out of the sling.
- B. The sling shall be made from a polyester/nylon net material that is pliable, breathable and easy to use. The sling shall cradle the body of the patient.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Install ceiling mounted patient lift system as per manufacturer's instruction and under the supervision of manufacturer's qualified representative and as shown on drawings.
- B. If the distance in between the suspended ceiling and anchors is more than 18" consult with manufacturer to determine if lateral braces will be required.

3.2 INSTRUCTION AND PERSONNEL TRAINING

Training shall be provided for the required personnel to educate them on proper operation and maintenance for the lift system equipment.

3.3 TEST

Conduct performance test, in the presence of the VA COR and a manufacturer's field representative, to show that the patient lift system equipment and control devices operate properly and in accordance with design and specification requirements.

3.4 INSPECTION

Inspection of installed ceiling mounted patient lift systems shall be conducted in accordance with the manufacturer's installation checklist and the facilities installation checklist (Patient Safety Alert AL14-07) prior to use for patient movement.

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SECTION 12 24 00**WINDOW SHADES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Section includes electrically operated roller shades with automated shade control system. Window shades shall be furnished complete, including brackets, fittings and hardware, controls, and software.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS.
- B. 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. Samples:
 - 1. Shade cloth, each type, 600 mm (24 inch) square, including cord and ring, showing color, finish and texture.
- C. Manufacturer's literature and data; showing details of construction and hardware for:
 - 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

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1.5 WARRANTY

- A. Work subject to the terms of the Article "Warranty of Construction", FAR 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.
 3. Roller Shade Motors and Motor Control Systems: Manufacturer's standard non-depreciating five year warranty.

PART 2 - PRODUCTS**2.1 SHADEBAND MATERIALS**

- A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. 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.
- C. Shade Bands: Construction of shade band includes the fabric, the hem weight, 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.
1. Fabricate shade cloth to completely fill openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.
 2. 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.
 3. 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.
 4. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards,

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shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shade cloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

5. 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.
 6. Rollers: Extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without excessive deflection; minimum 64.77 mm (2.55 inches) diameter. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- D. 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 motor or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
 3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of eight 45 degrees from the motor axis between shade bands, or four 22.5 degrees, on each side of the radial line, by a single shade motor (multi-banded shade, subject to manufacturer's design criteria).

2.2 MOTORIZED OPERATING SYSTEM

- A. Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
- B. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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- C. Electric Motor: UL-approved or -recognized, totally enclosed, insulated motor, complying with NEMA MG 1, with thermal-overload protection, brake, permanently lubricated bearings, and limit switches; with internal digitally encoded motor control system used with standard Cat-5 and Cat-6 cabling and modular plugs, sized by shade manufacturer to start and operate size and weight of shade considering service factor or considering Project's service conditions without exceeding nameplate ratings.
 - 1. Service Factor: According to NEMA MG 1, unless otherwise indicated.
 - 2. Motor Mounting: Within manufacturer's standard roller enclosure.
 - 3. Quiet Operation: 46 dBA operation measured from 3 feet open air from the motor.
- D. Remote Controls: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following devices for remote-control activation of shades:
 - 1. Individual/Group Control Stations: Manufacturer's standard low-voltage switches which utilizes Cat-5 and Cat-6 cabling, designed to work with digitally encoded motor control system. Individual switch control station with master switch for group control. Individual switch control stations shall be located in each nurse station and at the reception desk (A1-140A, A1-230A, A1-230B). Precise location to be coordinated with VA COR.
 - a. Color: White.
 - 2. Shade Positioning: Repeatable and precise alignment positioning including default customizable preset intermediate stopping positioning in addition to upper and lower limits.
 - 3. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop shade at fully raised and fully lowered positions.
- E. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.

2.3 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.

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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 32 00**MANUFACTURED WOOD CASEWORK****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies wood veneer casework and plastic laminate casework as detailed on the drawings, including related components and accessories required to form integral units. Wood casework items shown on the drawings, but not specified below shall be included as part of the work under this section, and applicable portions of the specification shall apply to these items. Each like item of casework shall be of the same design and by one manufacturer.
- B. Where shown, provide plastic laminate casework items as follows:
 - 1. As indicated
- C. Where shown, provide wood veneer casework items as follows:
 - 1. As indicated

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. Custom Casework: Section 06 20 00, FINISH CARPENTRY.
- D. Color and Finish of Plastic Laminate: Section 09 06 00, SCHEDULE FOR FINISHES.
- E. Lavatories and Plumbing in Casework: Section 22 40 00, PLUMBING FIXTURES.

1.3 MANUFACTURER'S QUALIFICATIONS

- 1. The fabrication of casework shall be by a manufacturer who produces casework similar to the casework specified and shown.

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. Sinks, trim and fittings.
 - 2. Locks for doors and drawers

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3. Adhesive cements

C. Samples:

1. Counter top, plastic laminate, 150 mm (six inch) square.
2. Wood Face Veneer or Hardwood Plywood.

D. Shop Drawings (1/2 full size):

1. All casework, showing details of construction, including materials, hardware and accessories.
2. Cabinets and counters showing faucets in connection with sink bowls, and electrical fixtures and receptacles which are mounted on cabinets and counters.
3. Fastenings and method of installation.

E. Mock-Up: Where required for special casework and where four or more similar units are involved, submit a mock-up of a typical unit for approval by Contracting Officer's Representative.

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. A167-99 (R2004) Stainless and Heat-Resisting chromium- Nickel Steel Plate, Sheet and Strip
2. A1008-07 Steel, Sheet, Cold-Rolled, Carbon, Structural, High Strength Low Alloy
3. C1036-06 Flat Glass

C. Composite Panel Association (CPA):

1. A208.1-99 Particleboard.

D. U.S. Department of Commerce Product Standards (Prod. Std):

1. PS1-95 Construction And Industrial Plywood.

E. Hardwood, Plywood and Veneer Association (HPVA):

1. HP.1-04 Hardwood and Decorative Plywood

F. Architectural Woodwork Institute (AWI):

1. Architectural Woodwork Quality Standards, Guide Specifications Quality Certification Program - 1999.

G. American Society of Mechanical Engineers (ASME):

1. A112.18.1-05 Plumbing Fixture Fittings.

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- H. National Electrical Manufacturers Association (NEMA):
 - 1. LD3-05 High Pressure Decorative Laminates.
 - 2. Performance, Application Fabrication and Installations of High-Pressure Decorative Laminates.
- I. Hardwood Plywood and Veneer Association
 - 1. HP-1 Hardwood and Decorative Plywood

PART 2 - PRODUCTS**2.1 ARCHITECTURAL WOOD CABINETS, 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.
- C. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- D. Low-Emitting Materials: Composite wood products shall be made with binder containing no urea formaldehyde.
- E. Low Emitting Materials: Products shall be fabricated with adhesives that do not contain urea formaldehyde.

2.2 PLYWOOD, HARDWOOD FACE VENEER

- A. HPVA HP-1, Premium Grade; wood veneer types as indicated in Section 00 96 00, SCHEDULE FOR FINISHES.

2.3 PLASTIC LAMINATE

- A. NEMA LD-3.
- B. Exposed decorative surfaces including countertops, both sides of cabinet doors, and for items having plastic laminate finish. General purpose Type HGL.
- C. Cabinet Interiors Including Shelving: Both of following options to comply with NEMA, LD3.1 as a minimum.
 - 1. Plastic laminate clad plywood or particle board.
 - 2. Resin impregnated decorative paper thermally fused to particle board.

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- D. Backing sheet on bottom of plastic laminate covered wood tops. Backer Type BKL.

2.4 PLYWOOD, SOFTWOOD

- A. Prod. Std. PS1, five ply construction from 13 mm to 28 mm (1/2 inch to 1-1/8 inch) thickness, and seven ply for 31 mm (1 1/4 inch) thickness.

2.5 PARTICLEBOARD

- A. CPA A208.1, Type 1, Grade 1-M-3.

2.6 COUNTERTOPS

- A. Refer to Section 12 36 00, COUNTERTOPS.

2.7 RUBBER OR VINYL BASE

- A. Refer to Section 09 65 13, RESILIENT BASE AND ACCESSORIES.

2.8 HARDWARE

- E. Where pin tumbler locks are specified, disc tumbler lock "Duo A", with brass working parts and case, as manufactured by the Illinois Lock Company will be an acceptable substitute. Locks for each type casework, shall be keyed differently and shall be master-keyed for each type service, such as Nurses, Psychiatric, and Administration. Provide two keys for each lock. Exposed hardware, except as otherwise specified, shall be satin finished chromium plated brass or nickel plated brass.
- F. Hinged Doors:
1. Doors 900 mm (36 inches) and more in height shall have three hinges and doors less than 900 mm (36 inches) in height shall have two hinges. Each door shall close against two rubber bumpers.
 2. Hinges: Fabricate hinges with minimum 2 mm (0.072 inch) thick chromium plated steel leaves, and with minimum 3.5 mm (0.139 inch) diameter stainless steel pin. Hinges shall be five knuckle design with 63 mm (2-1/2 inch) high leaves and hospital type tips.
 3. Fasteners: Provide full thread wood screws to fasten hinge leaves to door and cabinet frame. Finish screws to match finish of hinges.
- G. Locks:
1. Cylinder type pin tumbler.
 2. Equip doors and drawers where shown with locks.
- H. Drawer and Door Pulls:
1. Doors and drawers shall have flush pulls, fabricated of either chromium plated brass, chromium plated steel, stainless steel, or anodized aluminum.
- I. Drawer Slides:
1. Full extension steel slides with nylon ball-bearing rollers.

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2. Slides shall have positive stop.
3. Equip drawers with rubber bumpers.

2.2 FABRICATION

- A. Casework shall be of the flush overlay design and, except as otherwise specified, be of premium grade construction and of component thickness in conformance with AWI Quality Standards.
- B. Electrical Fixtures, Receptacles, Wiring and Junction Boxes required for Fixtures and Receptacles:
 1. Factory installed in casework.
 2. For electrical lighting fixtures, see drawings.
 3. For electric receptacles and lighting fixtures installed below or adjacent to wall cabinets or above counter tops, see electrical sections or specifications.
 4. Install wiring in built-in raceways and terminate at junction box mounted on rear of cabinet and counter.
 5. For final hook-up at junction box see electrical sections of specifications.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Set casework in place; level, plumb and accurately scribe and secure to walls, and/or floors.
- B. The installation shall be complete including all trim and hardware. Leave the casework clean and free from defects.

3.2 FASTENINGS

- A. Fastenings for securing casework to adjoining construction shall be as detailed on the drawings or approved shop drawings.
- B. See Section 05 50 00, METAL FABRICATIONS for reinforcement of walls and partitions for casework anchorage.

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 12 36 00**COUNTERTOPS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This section specifies casework countertops.

1.2 RELATED WORK

- A. General sustainable design documentation requirements: Section 01 81 11 SUSTAINABLE DESIGN REQUIREMENTS.
- B. Custom casework: SECTION 06 20 00, FINISH CARPENTRY.
- C. Color and patterns of plastic laminate: SECTION 09 06 00, SCHEDULE FOR FINISHES.
- D. 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

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3. C170/C170M-09 Test Method for Compressive Strength of Dimension Stone
 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

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- i. Breaking Strength of Tile (ASTM C648): 3,661 lbf
 - j. Fire Test Characteristics - Flame Spread (ASTM E84): 17
 - k. Fire Test Characteristics - Smoke Density (ASTM E662): Flaming - 196; non-flaming - 69
 - l. 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) custom 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.

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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 12 48 16**ENTRANCE FLOOR GRILLES****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. This Section includes recessed foot grilles and frames.

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. Slab depression for recessed foot grilles and frames: Section 03 30 00, CAST-IN-PLACE CONCRETE.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide foot grilles and frames capable of withstanding the following loads and stresses:
1. Uniform floor load of 300 lbf/sq. ft. (14.36 kN/sq. m).
 2. Wheel load of 350 lb (159 kg) per wheel.

1.4 SUBMITTALS

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for foot grilles and frames.
- C. Shop Drawings: Show the following:
1. Divisions between grille sections.
 2. Perimeter floor moldings.
- D. Samples for Verification: For each type of product indicated.
1. Foot Grille: 12-inch- (300-mm-) square assembled sections.
 2. Frame Members: 12-inch- (300-mm-) long Sample of each type and color.

1.5 PROJECT CONDITIONS

- A. Field Measurements: Indicate measurements on Shop Drawings.

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1.6 COORDINATION

- A. Coordinate size and location of recesses in concrete to receive foot grilles and frames.

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. B221-06 Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6061-T6 or Alloy 6063-T5, T6, or T52 as standard with manufacturer. Coat surface of frame in contact with cementitious materials with manufacturer's standard protective coating.

2.2 FOOT GRILLES

- A. General: Provide manufacturer's standard foot-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.
- B. Aluminum Foot Grilles: Provide manufacturer's standard foot grilles with extruded members, top-surfaced tread rails, and as follows:
 - 1. Tread Rails: Extruded-aluminum tread rails with extruded-aluminum frame.
 - a. Surface aspect: Cross-cut square surface with bolted cross supports.
 - 2. Finish: As specified per 09 06 00
 - 3. Grille Size: As indicated.

2.3 FRAMES

- A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.
- B. Provide sound gasket.

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2.4 FABRICATION

- A. Shop fabricate foot grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.
- B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.5 ALUMINUM FINISHES

- A. Mill Finish: AA-M10 (Mechanical Finish: as fabricated); grind and buff as required to remove scratches, welding, or abrasions produced in fabrication process.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine substrates and floor conditions for compliance with requirements for location, size, minimum recess depth, and other conditions affecting installation of foot grilles and frames.
- B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install recessed foot grilles and frames to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set foot-grille tops at height for most effective cleaning action.

3.3 PROTECTION

- A. After completing frame installations, provide temporary filler of plywood or fiberboard in foot-grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

3.4 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 12 93 00**SITE FURNISHINGS****PART 1 - GENERAL****1.1 DESCRIPTION**

- A. Furnish and install all site furnishings shown on drawings and specified in accordance with the manufacturer's instructions and as shown on the drawings and as specified.
- B. Related requirement specifications elsewhere:
 - 1. 32 13 00 SITE CONCRETE
 - 2. 32 90 00 PLANTING

1.2 REFERENCES

- A. Manufacturer's Instructions:
 - 1. Where required in the Specifications that materials, products, processes, equipment or the like to be installed or applied in accordance with manufacturer's instructions, directions or specifications, or words to this effect, it shall be constructed to mean that said application or installation shall be in strict accordance with printed instructions furnished by the manufacturer of the material for use under conditions similar to those at the job site.
 - 2. All site furnishings shall be anchored or otherwise secured to prevent movement, unless stated otherwise. Provide concrete footings, corrosion resistant clips, etc. as accepted by the Contracting Officer's Representative.
- B. Reference Standards:
 - 1. State of California, Business and Transportation Agency, Department of Transportation: "Standard Specifications."
 - 2. Manufacturers' specifications and recommendations.

1.3 COORDINATION

- A. Coordinate items of other trades. Contractor shall be responsible for the proper installation of all accessories embedded in concrete and for the provision of connections, holes, openings, etc., necessary to the execution of the work of the trades.

1.4 SUBMITTALS

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

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- B. Straight Wood Bench with Back: Shop drawings by manufacturer, color/finish samples for wood and metal.

PART 2 - MATERIALS**2.1 STRAIGHT WOOD BENCH WITH BACK**

- A. Product: Knight Bench with back, eight foot, surface mount, with armrests, manufactured by Forms+Surfaces (800-451-0410, www.forms-surfaces.com) or approved equal.
- B. Dimensions:
1. Overall dimensions: 96" long x 22.7" deep x 31.1" high
 2. Seat dimensions: 15.2" deep x 18" high
 3. Back height: 15.2"
 4. Armrest height: 20.75"
- C. Materials:
1. Seat slats: FSC 100% Ipe hardwood
 2. Bench frame: solid aluminum with invisible welds
 3. Slat fasteners: recessed stainless steel
 4. Armrests: solid aluminum
- D. Finishes:
1. Seat slats: penetrating oil finish.
 2. Bench frame: polyester powder-coat "Aluminum Texture".

PART 3 - EXECUTION**3.1 GENERAL INSTALLATION**

- A. Install manufactured items in accordance with the manufacturer's instruction and as shown in the drawings and as specified herein.
- B. Set all work true and square, plumb and level. Remove and replace any wood that splits during or after erection until acceptance. Keep nailing neatly lined up.
- C. Fabricate wood in as long pieces as practical unless otherwise indicated. End joints shall occur at supports. Keep all work clean, accurately cut, closely fitted and set to the required lines and levels. Blunt exposed edges by sanding or with plane.
- D. Place washer under the head and nut of bolts where same bear on wood, except head of carriage bolt. Drill bolt holes same diameter as bolt.
- E. Size bolts to fit flush with nuts. Countersink nuts and bolts as detailed.
- F. Hammers with scored faces shall not be used in nailing.

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- G. Supply all miscellaneous metal units and install as specified herein under the Sections entitled "Miscellaneous Metalwork" and "Galvanizing." Hot-dip galvanize all metal fastenings, angles, etc., after complete fabrication.
- H. Galvanized metal that is cut, damaged or modified after fabrication shall be immediately painted with Zinc-rich paint to prevent rusting.
- I. Touch up paint any damaged surfaces to match original finish as accepted by Contracting Officer's Representative.
- J. Transport, store and handle precast units and manufactured items in a manner to avoid hairline cracks, staining or other damage. Store units free of the ground and protected from mud or rain splashes. Cover units, secure covers firmly, and protect the units from dust, dirt or other staining material.

3.2 STRAIGHT WOOD BENCH WITH BACK

- A. Install level and in accordance with the manufacturer's instruction and as shown.

3.3 FINAL CLEANUP

- A. Remove all trash, debris, surplus materials and equipment from the project site when the work of this Section has been completed and at such other times as may be directed by the Contracting Officer's Representative.

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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.

1.2 RELATED WORK:

- A. Refer to all other divisions contained in these specifications for information related to the non-structural components defined above.

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

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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.
2. Type of pipe (Copper, steel, cast iron, insulated, non-insulated, etc.).
3. Pipe contents.
4. Structural framing.

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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.
 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.

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- 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.

1.6 REGULATORY REQUIREMENT:

- A. IBC Latest Edition. I=1.5 for all structures, unless otherwise noted on the drawings.

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- 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.
- 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.

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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.

3.6 FACADES AND GLAZING

- A. Tie brick veneers to a separate wall that is independent of the steel frame as shown on construction drawings to ensure strength against applicable

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seismic forces at the project location.

- B. Install attachments to structure for all façade materials as shown on construction drawings to ensure strength against applicable seismic forces at the project location.

3.7 STORAGE RACKS, CABINETS, AND BOOKCASES

- A. Install storage racks to withstand earthquake forces and anchored to the floor or laterally braced from the top to the structural elements.
- B. Anchor medical supply cabinets to the floor or walls and equip them with properly engaged, lockable latches.
- C. Anchor filing cabinets that are more than 2 drawers high to the floor or walls, and equip all drawers with properly engaged, lockable latches.
- D. Anchor bookcases that are more than 30 inches high to the floor or walls, and equip any doors with properly engaged, lockable latches.

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